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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Lamb-Raising Industry.

WITH the prospect of developing a Queensland export trade in fat lambs to the extent of at least 500,000 carcasses per annum, the Minister for Agriculture and Stock (Mr F. W. Bulcock) has arranged for the introduction of English types of rams which will be used for experimental purposes on the Darling Downs and on farms below the Range.

Arrangements have been made with the Brisbane Abattoir to treat the lambs so produced and to report on their condition. Reports from Smithfield when the carcasses eventually reach that market will also be supplied.

Mr. Bulcock is keenly interested in the possibilities of the lamb-raising industry. In the course of a Press interview he said that a conservative estimate placed the export figure at not fewer than 500,000 lambs per annum. The chairman of the Queensland Meat Industry Board (Mr. E. F. Sunners) had given very close attention to the matter, and had made the estimate, which was fully supported by other inquiries.

Queensland in the past had paid too little attention to the raising of the type of fat lamb for which there was a ready market overseas, added Mr. Bulcock. Recently experiments had been decided upon by the State Government in an endeavour to determine the right cross-breed type in various districts of the State. Up to the present rams of the Southdown, Border Leicester, and Romney Marsh breeds had been purchased. Now it had been arranged to buy more rams of British breeds in the Riverina district of New South Wales.

Arrangements had also been made for the use of a property at Cambooya as a receiving depot, and all rams from the South would be received there. They would be sent by arrangement to the sheep farmers to whom rams were being allocated. The Romney Marsh would be the only breed allotted to farmers below the Range, and the Border Leicester, Southdown, and Dorset Horn, and, to a limited extent, the Shropshire also, would be placed on the Downs.

Two farmers in each district had been selected for the purpose of carrying out this experimental work, Mr. Bulcock added. It was desired that any farmer who received rams under the plan should take two or three breeds, so that comparative data might be obtained. The plan would be extended to other districts as opportunity offered.

Hitherto fat lambs have not figured very largely on outward manifests from Queensland ports, so Ministerial policy in this connection will be commended by all interested in the further development of our export trade. A recent investigation shows that Queensland ought to be able to export at least 500,000 carcasses of fat lambs annually. Of more than 3,000,000 carcasses sent from Australia for the year 1932, Queensland contributed only 23,000; and two years before that shipments were as low as 11,000. Our seasonal conditions favour the fattening of lambs and landing them on the British markets before the early spring arrivals from any other part of the Commonwealth; and market reports show that early lambs always command a high price. To get the best results it is essential that the right type of lamb should be produced, and the methods chosen by the Minister are commended in commercial circles, as well as by many people engaged actively in or associated directly with rural enterprise. His proposal to co-operate with selected farmers in different districts in experimental and demonstrational work will have the effect of stimulating both individual and general local interest, and of ensuring the success of the project.

The Rise in Wool.

ALTHOUGH the pastoral industry has had to face disastrous losses in both the paddock and the market during the last few years, the rise in wool prices, together with a bountiful season in most grazing districts, has altered the whole outlook, especially for those who are able to replace their sadly depleted flocks. It will be a long time yet, however, before the industry can recover from the effects of the economic blizzard, but the improvement in the wool market is a happy augury of better times. What the increased prices for wool means to Queensland is very impressively set out in a recent review of our pastoral year. Based on the estimated output for 1933-34, and an estimated average of £20 a bale, the increased prices mean more than £3,000,000 yearly if values hold.

It is difficult, however, to estimate the value to the State and the Commonwealth of the improved market, because the selling season is only half way through. But on present figures, allowing for a substantial shortage due to adverse seasonal conditions, the Queensland output of 476,000 bales of greasy wool (including all shipments) may be estimated at £20 a bale gross, representing a return of £9,520,000, as against 500,523 bales for 1932-33 for a return of £6,499,561. This would, therefore, mean an improvement of more than £3,000,000 for the year. On the same basis, the whole Australian clip, approximately 2,823,700

bales, will probably return £56,000,000, compared with £35,043,054 for last year. To quote from the review referred to:—

> It is particularly pleasing to be able to show, by means of the average prices for the last three years, and for the six sales that had occurred during the first half of the 1933-34 season, the excellent recovery that wool prices have made. This is an improvement to be welcomed more especially in view of the disastrous times the producers have been through. Many of them had experienced heavy losses and were not in a position to restock. With the present exceptional season through Australia the outlook for a good increase in the total number of sheep is good.
>
> In view of the better prices now ruling, it is of interest to look back over the last few years, to weigh the past with the present. The prospects have already been indicated. From the official records of the Registrar-Geenral (Mr. G. Porter), and from statistics compiled by Dalgety and Co., Ltd., information of interest to all sections of the community is available. For instance, in the peak period of 1925-26 the State wool clip from 20,663,323 sheep realised £13,146,356 (average price a lb—greasy 26½d., scoured 46d.).
>
> Wool prices have been at a very low level for some years. To emphasise this it is necessary only to quote the average prices a lb. of wool for the years under discussion. Last year the average was a shade over 9d. a lb. For 1931-32 it was 8·61d., and for 1930-31 it was 9·86d. These averages provide an astonishing contrast with the 1925-26 averages—greasy 26½d., scoured 46d.
>
> This year, beginning with the first sale in June, a steady increase in the average price, as well as in the highest prices, occurred. These averages improved from 11d a lb. for greasy and 18·89d. for scoured wool, to 16·9d. and 27·55d., respectively.
>
> The highest prices—which are never so good a guide as the averages—improved from 16¾d. and 26¼d. to 25d. and 40¼d., respectively.
>
> A pleasing feature of these increases is that they represent no sudden jump, but a gradual improvement, which, it is hoped, may continue, or at least remain steady.

The Agricultural Outlook.

REVIEWING the agricultural situation generally at the end of the year, the Director of Agriculture (Mr. A. E. Gibson) said in the course of his remarks that the outlook for the agricultural industry in Queensland this year is particularly bright from a production point of view.

The maize-growing areas of the State had received a thorough soaking, the spring crop was fast approaching maturity, and conditions were all that could be desired for the standing corn.

Summer fodder crops were looking well, particularly the sorghum varieties and panicums. Farmers should seize the opportunity to conserve surplus growth which it was reasonable to suspect would not be required for purposes of autumn stock feeding, in view of the flush growth at present noticeable in the pastures.

The Minister's New Year Message.

To the

FARMERS OF QUEENSLAND

RECENTLY I heard a traveller of wide-world agricultural repute refer to our farming community as "Australia's sturdy yeomanry." It was, I think, an apt phrase, rich in historic associations, and expressive of our heritage of determination and resolute courage. These attributes have been in clear evidence during the year just ended. Hope and disappointment have alternately held sway over our farming population, but rarely has despair assailed us.

A courage carrying with it a vision of the future is slowly but surely being justified, and we may look forward to happier times during the coming year.

The most notable achievement of the year in rural economics was the stabilisation of dairy products, and this should prove the forerunner of a general Australia-wide stabilisation policy based on Australian standards.

The past year witnessed a steadily growing world-wide movement towards the maintenance of economic security for our farming peoples, and we may reasonably anticipate rapid and beneficial readjustments as soon as the necessity for them is clearly demonstrated.

On behalf of the staff of the Department of Agriculture and Stock and myself, I wish the producers of the State health, security, and contentment during the coming year.

Frank. W. Bulcock

Banana Thrips and the Problem of Its Control.

By J. HAROLD SMITH, M.Sc., N.D.A., Entomologist.

(Continued from page 524, Volume XL.)

Sulphur and Nicotine Dusts in the Control of the Banana Thrips.

THE possibilities of inert dusts for the control of the banana thrips have been thus carried to a stage at which there appeared to be no material advantage in pursuing the subject further. One other line of inquiry, however, seemed to warrant investigation, this being the utility of sulphur dusts.

In recent years entomologists have paid some considerable attention to the quality of the sulphur dusts used for insecticidal purposes, and have consequently dispelled some of the confusion previously associated with their action. These developments have led to an improvement in the commercially available supplies, although the products are hardly yet sufficiently standardised. For present purposes, the following points are significant:—

(*a*) That the principal toxic to both insects and fungi is gaseous sulphur. Other probable constituents in an atmosphere bearing particulate sulphur may be sulphur dioxide and hydrogen bisulphide, but these have been shown to be relatively non-toxic on ordinary concentrations such as are found in the field.

(*b*) That atmospheric conditions limit the toxicity of the dust. The chief among these would be temperature, which is said to determine the production rate of the volatile derivatives given off at the higher temperature range. In the view of some workers, humidity is also a conditioning factor, but Goodwin and Martin, working under controlled laboratory conditions, demonstrated that varying humidities make no appreciable difference in the rate of volatilisation at the same temperature. Other factors have been also suggested, but the contribution of these is negligible except in so far as they alter, directly or indirectly, the temperature at which volatilisation takes place. The temperature influence may help to explain the contradictory reports circulated by users of sulphur dusts, and to evaluate any worth which they may possess. Using deposition of stains on copper as the index to the rate of volatilisation of sulphur, Goodwin and Martin showed that at temperatures above 100 degrees Fahr. the increase in the rate of generation of sulphur fumes is very rapid. Confirmation is obtained in the field by the fact that it is invariably in regions of high temperatures that sulphur finds a niche in entomological practices. Thus, in California sulphur dusts are requisitioned in quantity for the control of the citrus thrips, a pest of some notoriety in that State. In view of this it would seem that, given good-quality sulphur dusts and similar temperatures, comparable results would be obtained in other parts of the world.

Great strides have been made in the manufacture of sulphur dusts during recent years, and significant developments are pending. This trend is outlined by De Ong and Huntoon. Working on the assumption that the inherent value of sulphurs depends on the state of subdivision, improvements in grinding methods have been introduced, and to-day very fine grades of ground and sublimed sulphurs are procurable in Australia. Precipitated sulphur, which has attracted some interest, is obtained by a variety of methods during the extraction of illuminating and oil refinery gases. The method of precipitation controls the particle size. Fineness is probably their greatest asset, and some experimental work has been carried out which indicated that this form of sulphur was worth investigating for the control of the banana thrips. Laboratory and field experiments were accordingly initiated.

Laboratory tests preceded and determined the scope of the subsequent field work. Initial stocks of precipitated sulphur were purchased locally, the sample procured showing greyish-green characteristics. The laboratory trials were arranged in the same manner as adopted in the trials of inert dusts, with the slight but significant difference that at least one-third of the individuals in each colony were adults. The establishment of the colonies on dusted fruits was anything but an easy matter, for both immature forms and adults tended to leave the fruits on which they were placed and wander over the walls of the glass container. The younger forms were particularly sensitive and their survival value was consequently low, but some larvæ and a few adults kept the colony intact for a few days. Ultimately, within a week, the colony if not exterminated was reduced to dimensions insufficient to cause rusting on the surface of the fruits. On the check fruits the initial colony throve for some time, and at the end of a fortnight or so its numbers were increased through the addition of first-stage larvæ hatched from eggs laid in the fruit subsequent to the establishment of the colonies. No parallel phenomenon occurred in the sulphured fruits, though eggs had been laid in the rind. It can hardly be supposed that the sulphur would have an ovicidal value; hence it is more probable that the physiological role of the sulphur is to inhibit the effective emergence of the larvæ at the time of eclosion from the egg. Such observations as those provided by closed containers can hardly be translated into the field—there are decided differences in the two habitats; but they indicate that under certain positive conditions some forms of sulphur may play a useful role in the control of the banana thrips.

Preliminary trials in the field during the same summer confirmed the observations in the laboratory. Here the sulphur dispersed individuals in the colonies from the base of the hands, the insects shifting to the tips of the fruits. After dispersion, colonies were not re-established, and it seemed certain that the numbers, particularly of the first-stage larvæ, had been considerably reduced, either by death *in situ* or by dropping off the fruit. The dust used in the field on this occasion was identical with that handled previously in the laboratory, and the results were for the most part comparable.

From these preliminary results, wider work in the field seemed desirable on a scale sufficiently large to estimate the value of precipitated sulphur and some other selected dusts, not on the thrips infestation, but rather on the rust incidence which forms the economic significance of the pest. One consideration which hampers the critical evaluation of

any insecticide applied to the banana bunch is the impracticability of accurately measuring the rust incidence. There may be variations from bunch to bunch and from hand to hand within the one bunch; there may be discolouration without splitting should thrips attack be delayed, or splitting without marked discolouration should early infestation be heavy and growth rapid. Still, as the thrips population, for reasons already set out, is not an index of the economic significance of the pest on any particular plantation, an attempt must be made to measure rust in some intelligible terms. Without this any opinion on the worth of control measures depends entirely on the observer's ability to translate his own visual appreciation of any given rust appearance to other people.

For the purposes of the field work about to be described, an effort has been made to classify bunches when harvested on a basis of rust incidence, each individual bunch when cut being placed in one of the following categories:—

A.—Bunches in which the discolouration, if any, is restricted to the base of the fruit; blemishes insufficient to affect the value; assigned numeral—1.

B.—Bunches with rust along the sides of the fruit both at, and away from, the base of the fruit, though with no signs of obvious cracking; mild infestation of the bunch with extended discolouration due to the phenomenon of fitting between adjacent fingers; assigned numeral—2.

C.—Bunches in which the cracking is superimposed on rust with a fairly extensive range; early thrips infestation followed by growth cracks on the feeding surfaces; assigned numeral —3.

D.—Bunches in which splitting has appeared on the surfaces of at least some of the fruits, while others are badly cracked; assigned numeral—4.

In connection with the marketing of these four grades of bunches, no waste would be found in the first group and very little in the second. C and D are definitely poor grades, the fruit in which would hardly warrant despatch to the southern markets unless ruling prices were exceptionally high. Good-quality fruit may sometimes be culled from some of the hands in grade C, though little could be salvaged from the poorer grade D.

These four categories are entirely arbitrary and inevitably express a mean for the bunch concerned in which, of course, the rust incidence of the fruit in each hand will vary. In classifying the bunches on the above basis it was found that the condition of the upper four hands determined the quality assigned to individual bunches, for unless abnormal conditions supervened—*e.g.*, fruit fly infestation and the use of stockinette for protection—the terminal hands included some saleable fruit. Most of the larger and better filled fruits in the basal hands suffer more severely from rust than the slower maturing fingers in the terminal hands, and the total loss on this account may be considerable. Some growers tend to wait till the lower hands are thoroughly filled before cutting the bunch, and in doing so often sacrifice the good fruit in the upper hands for that of inferior quality in the lower. In the present work the fruit was cut as early as was compatible with reasonable maturity.

As stockinette sleeves tend to aggravate the rust incidence in the bunch from a given thrips population, no special precautions were taken against the fruit fly, hence losses from this cause were anything but negligible, and as might be expected the occurrence of split fruits through the plantation increased the losses due to this pest.

The plantation was regularly laid out, and two acres with a south-easterly aspect bearing stools just about to bunch were selected for the work. The plants had been well tended, weed growth being kept down to a minimum and the old leaves stripped regularly. The soil type was akin to that associated with the more destructive outbreaks of thrips rust in the north, being reddish in colour, volcanic in origin, and typical of many of the foothills along the North Queensland coast. No fruit had been cut prior to the first dusting, and 454 bunches were traced through their whole development from the time of inversion to cutting. The systematic examination of these at weekly intervals allowed regular observations on thrips activity during the summer months, the development of rust in relation to thrips population, and the influence of bunch conformation on rust incidence.

Two areas were selected, each comprising approximately one acre, and rows in these were mapped out on a system suitable for field experimental work, so that each row subjected to a single treatment represented a single plot. Thus in the first area there were 16 plots with quadruplicate treatments of three dusts and equivalent checks, while the second held 12 plots with triplicate treatments and the necessary checks. In the former, treatments were made weekly and in the latter fortnightly. Each plot in the first area carried some 12 to 19 recordable bunches in the row, while the larger plots of the second area ranged from 27 to 43 with the majority round the 30 mark. The discrepancy in the number of bunches matters little, for any conclusions which may emerge from the work will be drawn from both qualitative and quantitative data. The arrangement of the work on quantitative lines tests the method in this class of work, while the incidental semi-random distribution of the plots reduces, or ought to reduce, differences in rust incidence due to variable bunch conformation ascribable to scrub shade, subsurface drainage, &c.

Three dusts were submitted to comparative tests:—

(a) *Nicodust*—a proprietary brand containing 2 per cent. of nicotine as nicotine sulphate with hydrated lime as filler.

(b) Precipitated sulphur showing the following analysis:—

	Per cent.
Sulphur	97·2
Ash	2·1
Chancel degree of fineness	82

The sample used in the preliminary trials had the constitution—

	Per cent.
Sulphur	99·6
Ash	·2
Chancel degree of fineness	85

but apart from its greater purity and better particulate form, there was quite a difference in the colour of the two types. The preliminary sample was greyish-green, very different from the bright yellow mass appearance characteristic of the bulk supplies used in the large scale field experiments now under discussion.

(*c*) Nicodust and precipitated sulphur in the proportions 2 : 1, being mixed immediately before using.

All three dusts were applied to the plants by means of a rotary dust gun fitted with a flexible arm, the construction of which is detailed in Appendix IV. The fishtail feed gave an even charge, while the manipulation of the apparatus involved no difficulty.

In evaluating the effects of any particular treatment, the rust incidence values for each plot were determined as shown in Appendix III., using as a basis for calculation the numerals assigned to each bunch at the time of cutting. The four categories A, B, C, and D carry the values 1, 2, 3, and 4 respectively, hence in the estimate for the value of any particular dust, an assigned value of, say, 1·5 would indicate that the value of the bunches lay midway between categories A and B.

The summary values given to each treatment in the two areas at the conclusion of the work were as follows:—

—	Area I. (Treatments Weekly.)	Area II. (Treatments Fortnightly.)
Nicodust	1·7	2·3
Nicodust and precipitated sulphur	1·8	2·2
Precipitated sulphur	2·1	2·4
Check rows	2·5	2·1

The nature of the data is such that any statement of the calculated standard error would mean very little, but the summary statement is suggestive. In the weekly treated area, the maximum rust incidence per plot occurs when bunches are untreated, and the minimum is found when nicodust is used. On the other hand, fortnightly treatments with any of the three dusts effected no noticeable improvement. In discussing the pros and cons of quantitative data, a number of considerations have to be kept in mind which concern the different conditions in different parts of the plantation during the season. Of the two areas, that dusted fortnightly occupied the upper end of the slope, while the other abutted against a gully at its lower end. For sundry reasons, probably associated with drainage, the stools growing in the vicinity of the gully possessed a more vigorous growth than the remainder of the plantation, and bunching difficulties which were general through the plantation in January were less accentuated there. The season was somewhat exceptional. Normally, summer rains commence in late December or early January, but in the summer of 1930-31, exceptionally dry, hot weather continued until the end of January. Bunches thrown during this dry spell in the first three weeks of the month were invariably badly rusted, not on

account of a larger thrips population than that of the early and late thrown bunches, but following compaction of the hands and delayed inversion. Those in the upper part of the slope showed the abnormalities to a very marked extent. Such bunches are always difficult to dust properly, and they introduce added variations from bunch to bunch in the efficiency of their individual treatments. Another disturbing factor was introduced into the plantation in February, when a virulent form of leaf spot swept through part of the area, commencing in the gully region adjoining the scrub and working outwards.

The interaction of all these factors on the data does not, however, obscure some of the more obvious conclusions emerging from the work. The chief among these are—

(*a*) If bunches are thrown normally, weekly dustings with nicodust do minimise losses due to the banana thrips, even when the pest is more than normally destructive. Conversely, if bunches are thrown abnormally, dusting, no matter how efficiently carried out, is incapable of adequately coping with the trouble.

(*b*) Precipitated sulphur used either weekly or fortnightly gives no appreciable control over the banana thrips under conditions of heavy infestation, while no advantage is secured by combining the nicodust with the brand of precipitated sulphur used.

(*c*) The general health of the plantation is a necessary basis for thrips control, without which any supplementary measures can only be of limited value.

The disparity between the results with precipitated sulphur in the field and in the laboratory is somewhat striking. Normally it is accepted that the toxic properties of the dust depend entirely on the generation of gaseous sulphur, the rate of generation being controlled by ruling temperatures. The dust is consequently most used in countries characterised by high day temperatures during the pest-active season. In coastal Queensland, the shade temperatures during the summer months vary between maxima of 80 and 100 degrees, sometimes going above the latter, though not for any considerable length of time. The lower temperatures are common during the wet periods, and the higher when dry conditions suitable for dusting occur. These shade temperatures, however, give little indication of the real conditions in the bunch habitat, for it is quite exceptional to find the whole of the bunch under shade conditions. Hence in any one bunch, part may be in complete shade while the remainder is exposed, and the mean effective temperature over the whole bunch would be much higher than either of these figures, at least during the spells of fine weather. The rate of generation of gaseous sulphur increases rapidly when the temperature rises to 100 degrees Fahr., and bunches grown in the North ought to respond to treatment, for the temperatures are within the limits required for the rapid generation of the fumes. Apparently the presumption does not hold for the quality of the dust used.

Any discrepancy between the results in the field and those in the laboratory with any one sample of precipitated sulphur may be ascribed to dissimilarities in the two environments. In a glass cylinder kept indoors there would be no air currents to waft away fumes which

would otherwise accumulate to a concentration toxic to the insects. But the more important discrepancy, however, is not that between the field and laboratory data—it is rather the vastly different results from field trials with two different samples of precipitated sulphur, only one of which had been used in the laboratory. A difference of this kind must depend on the quality of the dusts used. There are therefore two factors which together or independently may shed light on the observed data, the first concerning the absence of air currents in the laboratory, the other the quality of the dusts used. The former requires no special elaboration.

The samples of precipitated sulphur used in the earlier phases of the work were greyish in colour, in contrast to the bright yellow of the bulk supplies purchased at a later date. Variations in the colour of different brands of sulphur are usually put down to the nature of the impurities in the sample, but their association with the insecticidal value of the dusts is indicated by the following quotation from a paper by De Ong and Huntoon:—

> "The grey colour of the sulphur recovered in the gas-purification process favours sublimation at low field temperatures. This principle has long been recognised in France, where dark-coloured sulphurs are chosen for early spring work on the control of mildew."

Attempts to elucidate the chemical basis behind the practice have so far met with no success, but the point may prove to be of interest not only in connection with the explanation of the current experimental work but also in connection with the standardisation of dust for insecticidal and fungicidal requirements. At present the relative merits of the various sulphurs are supposed to depend entirely on the particulate size of the samples, following the assumption that gaseous generation is proportionate to the surface area exposed. Perhaps other factors are of equal importance. Two problems would thus seem to emerge from the work on sulphurs—

(*a*) What are the distinctive principles of the grey-coloured sulphurs which encourage the sublimation at comparatively low temperatures? Such sublimation may be due to some special impurity from a particular method of manufacture, but, in any case, it is a chemist's rather than an entomologist's problem.

(*b*) Is the particulate size of any sample of sulphur an accurate index of its toxicity over the whole temperature range?

It has been impossible to get supplies of precipitated sulphur comparable to those used in the first instance, and for that reason work in the field has been suspended; but even were they available, the two questions should be answered before it can be profitably resumed.

The losses in the plantation as a whole through rust were consistently high, except in those plants treated weekly with the nicodust. If the bunches when first completely exposed were clean, they could be kept clean. The values assigned to the bunches indicate the real value of repeated dustings, though they probably under-estimate it, for the arbitrary numerals assigned to bunches of different quality tend to lessen the statistical influence of the best and exaggerate that of the worst fruit.

The main objection of the grower hinges on the cost of the operation. There is some ground for this criticism, though actually the economic justification of dusting depends on the anticipated value of the fruit when marketed. It is rather unfortunate, therefore, that fruit grown during the summer when some control measures are imperative should be sold at prices depressed by the seasonal influx of other fruits to the principal markets. The advisability of dusting is, however, a matter for the grower to decide after weighing all probable eventualities. In most plantations the expense of the insecticide would not be the determining factor. It is rather the cost of the necessary labour, which can be very considerable when repeated dustings are required. This item in the cost has, in the past, been particularly high because the available dusting apparatus, designed for other purposes, is in many respects quite unsuited for the bunch treatment of the banana plant. Bulb blowers or small dust guns have both been used, but the hopper capacity of each is limited, while the thorough dusting of any series of bunches requires some agility on the part of the operator. The device used in these experiments is a considerable advance on either of these, though, even so, it is crude and capable of improvement. It consisted of an ordinary rotary duster in which the feed arm was converted from the rigid to the flexible form. This permitted a dust discharge in any desired direction, while the ordinary mechanics of the duster ensure a more even dust cover than any other method. The time necessary to treat individual bunches is correspondingly reduced and the incidental labour charges with it. Even so, the cost of dusting remains admittedly high, but an observant grower can still further reduce it by adjusting his dusting to the precise needs of his plantation. No good purpose is served by dusting bunches before the bracts loosen, and little before they are shed from the bunch. No remedy can be prescribed for injury prior to this stage, but adequate dusting at the bract-shedding stage will inhibit further thrips development and minimise the injury accordingly. Systematic dusting may then keep the thrips population within reasonable bounds.

In this series of field experiments, only a nicotine dust in which nicotine sulphate furnished the toxic ingredient was used. Nicotine sulphate is very convenient from the manufacturer's point of view, for it is a standardised product which lends itself to the preparation of dusts with a given nicotine concentration. From the entomological point of view it has, however, certain drawbacks. When exposed, free nicotine is given off, the rate of evolution varying with the temperature at the time of application. The rapid evolution of nicotine fumes is very desirable in the control of the banana thrips. Dusts in which free nicotine is substituted for the nicotine sulphate liberate toxic fumes more rapidly than those containing nicotine sulphate, and thus better meet the special requirements of this problem. A comparison of both types of dust in the field has shown that these free nicotine dusts have a greater value for the control of the banana thrips than the nicotine sulphate dusts in common use throughout the State. It is therefore suggested that if the incorporation of free nicotine in dusts can be effected without interfering with the desired standardisation of the insecticide, manufacturers would be well advised to make the substitution.

In the summer of 1929-30 experiments with a mixture of a free nicotine dust and precipitated sulphur showed rather promising results in the field. These prompted the inclusion of similar trials in the

summer of 1930-31, but the results as just recorded are disappointing. Subsequent inquiry into the quality of the dusts showed a difference in the alkalinity of the two samples of sulphur, one being neutral and the other alkaline in their respective reactions. The alkalinity of the second sample of sulphur would depress the toxicity of the nicotine dust, and the disparity of the two results may be attributed to this cause, together with differences in the quality of the sulphur used. There is, however, no reason to suppose that such a compound dust with ingredients possessing the desired specifications should not be an improvement on the nicotine dust when used alone for the control of the banana thrips if the prices are comparable. The independent effect of the sulphur should be apparent after the toxic properties of the nicotine have been exhausted. Further work on this subject is much to be desired.

GENERAL DISCUSSION.

From the data presented it may be practicable to summarise the work, discuss its implications on the larger question of control, and restate the problem for the future. It has been pointed out that the general health of the plantation furnishes a fairly good indication of the possible worth of even the best control measures formulated. If this is at a low level, abnormalities in bunching and rates of bunch development both increase the period of pest effectivity and limit the utility of any dusts which may be used. It may be a mere coincidence that the extension of rust incidence through the State in recent years has coincided with the general deterioration of many plantations. But in view of the early discussion of the factors which tend to increase the losses in the fruit due to the banana thrips, there would appear to be strong grounds for supposing that there may be some relation between the two events. Some years ago the life of a plantation covered a profitable period of from four years upwards, but to-day very few plantations last for even four years. Various explanations have been suggested—the cumulative effects of pest and disease organisms, the transition of plantations from good to poorer types of soil, the widespread incidence of root failure and, perhaps, stock deterioration. There may be a certain amount of truth in all these, but from the present viewpoint their cumulative effect is to introduce growth conditions more favourable to thrips activity than would otherwise be the case. The tacit association in the south of thrips activity with dry weather conditions may again be a reflex of the same thing. One is too apt to assume that acute rusting in any district is associated with an epidemic of the pest. It may be partly so, but the precise conditions which are said to favour such hypothetical epidemics are precisely those which induce morphological aberrations in the plant, themselves sufficient to accentuate the injury caused by any given thrips population. The southern experience in 1931 is a case in point—a severe dry spell synchronising with unprecedented rust over a great part of the commercially producing areas, and at the same time producing all the abnormalities previously described in some detail.

The work has so far been confined to dusts which are cheap enough to be adopted in plantation work if they are sufficiently effective to make any appreciable contribution to the control problem. The supposed efficacy of some stomach poisons is found to be an attribute, not of the toxic constituent but of the physical properties belonging to the dust or spray deposit, these probably inhibiting the free movement of the insect.

The studies on this phase of the subject do not indicate any great possibilities for inert dusts as at present available. An improvement could no doubt be effected if the dusts were applied in fluid media to which spreading materials had been added, but the practical obstacles seem insuperable. Until some means are devised for increasing the adhesion of such dusts to the surface of the fruit, no further progress seems possible. The problem has been recently broached in America in another connection, and oil fluids are incorporated into the dust for this purpose just before application. The manufacturing difficulties are, however, of some moment, for though, perhaps, simple when the requisite mixing plant is available, they can hardly be duplicated in Queensland banana plantations. It will be interesting to follow developments in this field of research, for they cannot but impinge on the local problem, even though inert dusts are themselves relegated into the background. If such improvements could be introduced for, say, nicotine dusts, they would serve a dual purpose—first in the destruction of the thrips, and second in restricting the pasturage of any colonies which may subsequently be established. At present, however, no good purpose is to be served by farmers applying inert dusts in preference to others which are known to have definite toxic properties.

Of these, dusts with a nicotine content are most important. Even under conditions of heavy infestation far in excess of that common in the South, tangible control can be secured by weekly applications of the dust. Wider-spaced applications proved of little value when the infestation was heavy. It is probable, however, that under southern conditions, where the numerical incidence of the pest is normally less than in the North, fortnightly dustings may be useful, but without any experimental experience on the subject no definite opinion can be expressed. The labour costs incidental to dusting can be materially reduced and the efficiency of the treatment increased if the rotary duster modifications detailed in Appendix IV. are adopted. Without some such improvements, the labour costs can easily be excessive. Doubtless the device can be improved by engineers whose province it is to devise apparatus of this kind.

At the present time the bulk of the nicotine-containing dusts used in the State consist of hydrated lime in which is incorporated the required amount of nicotine sulphate. The adoption of the latter as a source of nicotine may be due to the standardisation of the supplies and the consequent simplicity of the manufacturing process. Actually, however, the toxicity of the dust is dependent on the rate at which the nicotine sulphate dissociates and liberates nicotine, the generation of which is accelerated at high temperatures. Better results are procured when free nicotine rather than nicotine sulphate has been used in the preparation of the dust, for the evolution of the fumes is more rapid and the toxicity consequently increased. It is suggested, therefore, that if the preparation of nicotine dusts with free nicotine is practicable, manufacturers would be well advised to make the substitution.

The utility or otherwise of sulphur is still an unsettled question, the present studies having led up to what are essentially chemical questions. Precipitated sulphur of an exceptionally high quality and a dull grey colour yielded very promising results in both the laboratory and the field. Subsequent work with a lower-grade precipitated sulphur gave results in no way analogous to these. There are two possible

explanations of the varying results attributable to the two forms. The analyses suggest greater purity and finer particulate dimensions in the better sample, and perhaps this in itself, by increasing the gaseous generation at any given temperature, would be a sufficient cause for the observed results. Peculiarly enough, it has been impossible to procure further supplies of the better type of precipitated sulphur. Those obtainable of equivalent fineness are quite distinct in colour, being bright yellow rather than grey. In the literature dealing with sulphurs there are occasional references to some of a greyish colour which are credited with high insecticidal properties. There has apparently been no attempt to explain the colour or to prove any association with the insecticidal properties of the sulphur, though it is assumed to bear some such relation. There is thus evidence that this colour has significance for the entomologist. Until this evidence is sifted, it must be assumed that particulate size alone determines the insecticidal properties of any given sulphur dust. This assumption has been responsible for considerable improvements in the manufacture of sulphur dusts, and specially treated sulphurs, ground, precipitated, and colloidal, are on the world market. Some of these may be useful for certain pests, but the prices quoted in Australia are often quite prohibitive so far as the control of the banana thrips is concerned.

Recommendations.

(*a*) Nicotine dust in which the toxic ingredient is free nicotine and the carrier hydrated lime has proved the most efficient of the dusts handled, and it is suggested that during the summer months growers should make the necessary provision for the treatment of their fruit. Dusting should commence immediately the bracts are shed; bunches may be dusted earlier, but there is no experimental evidence to indicate that any advantage is gained by doing so. If the cost of the operation is to be kept down to a minimum, the apparatus should be based on the principles outlined, the feed arm of the rotary duster being converted to the flexible type. With all nicotine dusts, the best results follow their application when temperatures are high, hence midday treatments should yield the best results.

(*b*) Cultural practices such as manuring, suckering, &c., should all be designed to induce favourable growth conditions when the bunches are being thrown. Where a grower may reasonably expect his plantation to last over a period of years, he would be well advised to make his winter and spring crops his main source of income if the suckering programme can be so arranged. His bunches would then be thrown in autumn and early winter when the pest is least active. Any decrease in the size of his fruit would be amply compensated by the better market prices ruling when such bunches are cut. The severity of thrips rust incidence depends very largely on the grower's ability to maintain vigorous growing conditions in his plantation by good cultivation and the control of subsidiary pests and fungi.

(*c*) It is very desirable that the chemist, working under controlled laboratory conditions, should investigate the conclusions which seem to emerge from the current work with sulphur dusts.

Summary.

(*a*) The banana thrips previously regarded as an exclusively northern pest has during recent years penetrated the major producing areas in the south. At present it seems to be distributed through the whole of the State, though not always associated with rust on an injurious scale.

(*b*) The disparity between the incidence of the pest and the loss induced by it is traced to abnormalities in the bunch. In the absence of the insect, these would be of no great significance; coexistent with it they aggravate the injury. The main types of abnormality are discussed and their relation to the pest described. It is suggested that the recent increase in the losses due to the pest is associated with a deterioration in many plantations.

(*c*) Some studies have been carried out in connection with the control of the pest by dusting. Inert dusts such as kaolin and talc are found under laboratory conditions to limit the pasturage of the pest on the surface of the fruit at given concentrations. Instances of partital control by lead arsenate may be attributed to the physical properties of the spray or dust cover rather than to the toxic properties for which they are generally used. The utility of inert dusts for the field is limited by their general lack of adhesion and the frequent precipitation during the summer months.

(*d*) Favourable results in the control of the banana thrips by precipitated sulphur have followed the use of certain brands characterised by a greyish colour and extraordinarily fine particulate size. Some others more commonly available yielded less favourable results, hence there would appear to be scope for further work on this subject. Even if standardised brands of the better class precipitated or colloidal sulphurs were available, the current prices at which they are quoted would make their use uneconomic.

(*e*) Weekly dustings with nicotine dusts have given a reasonable measure of control in cases of unusually heavy infestation. The nicotine-containing dust should, however, be compounded of free nicotine rather than nicotine sulphate. The economics of the measure largely turn on the labour cost of application and improvements in the usual dusting devices for the specific purpose of treating banana bunches are suggested.

Acknowledgments.

The many-sided aspects of a problem such as this have prompted discussions with specialists in other spheres on several occasions. The writer is indebted to the entomological and other staffs at headquarters for their constant collaboration, to field officers of the Fruit Branch for assistance in connection with the plantation work, and, not least, to the growers who have made their fruit available for treatment. To all thanks are tendered, in particular to the Chief Entomologist, Mr. Robert Veitch, whose appreciation of the difficulties inherent in the problem has been a constant simulus.

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APPENDIX I.

THE ARTIFICIAL INDUCEMENT OF THRIPS RUST.

The experimental material consisted of two bunches, labelled for the purposes of reference A1 and A2, the former having just shed the bracts, while the latter was submature.

Bunch A1: Basal hand—Direct pricking with dissecting needles.

Fruits—

(*a*) Pricking comparatively heavy with considerable sap exudation. Pustules formed at each point of injury, with the outer edge dull green, the median portion ochraceous, and the hilum reddish-black; pustules in proximity to each other may coalesce; exuded sap persisted as drops of a gummy consistency.

(*b*) Pricking moderately heavy with little exudation. Features as in fruits (*a*), but pustules smaller in size and congealed drops fewer.

(*c*) Pricking mild with no obvious exudation. Features as in fruits (*a*) but congealed sap absent.

Bunch A2: Basal hand—Direct pricking with dissecting needles.

Fruits—

(*a*), (*b*), and (*c*), as in bunch A1.

Pustules as in A1, but larger in the younger bunch; the reddish-black hilum was absent, the entire centre cap being ochraceous.

Remarks—

(*a*) The whole of one side of the fruits was treated.

(*b*) The differences between the two bunches are explicable on the assumption that injured tissues of the older fruits have not the recuperative powers of the younger, and do not exude sap so freely.

Half the fruit was dusted and then inserted in a glass cylinder with shade adjustments, so that the clean portion was in the better lighted end. During the dusting the part to be kept free from a deposit was protected by means of paper wrappers. A thrips colony was established on the undusted section of the fruit, each colony comprising some fifty individuals.

Bristol board was attached to stiff cardboard by means of drawing pins, and the surface stained black with Indian ink. By pricking with a needle the white surface underneath could be exposed. Separate square centimetre areas on the one piece of Bristol board were thus arranged in a series which contained the following number of regularly placed white intrusions on a dark background:—

50, 100, 125, 150, 175, 200, 225, 250, 275, 300, 350, 400.

In estimating the dust concentration on any given fruit surface, the binocular appearance of such a surface was compared with the graded Bristol board series for purposes of visual comparison. From the known concentration of white spots in the square centimetre of Bristol board, the dust concentration on the fruit itself could be inferred, the magnification of the binocular being known.

The kaolin series was first arranged on 24th December, 1929, and contained fruits in each of the following series:—The numbers refer to the fleck concentration on the equivalent square centimetre of Bristol board showing the same mass appearance as the dusted surface under binocular observation:—

Series of Fruits.	Concentration at Initiation.
1	White
2	300
3	250
4	150
5	100
6	75

In series 1, 2 and 3, no thrips ventured over the dusted surface, and rusting was limited to the undusted parts of the fruits. In series 4, the line of demarcation between dusted and undusted parts of the fruit was less definite on the under surface where the colonies tended to congregate. Fruits in the remaining series showed rusting on both the dusted and undusted parts of the fruit, for the introduced insects split up into two sections one of which remained on the clean area while the other crossed the dusted surface to form a colony at the other end. Any limitation of rust incidence was due to a direct influence on the movements of the insect.

The critical point, *i.e.*, the minimum concentration which effectively hindered the movements of the insects, was between 6,000 and 8,000 particles per square centimetre of fruit surface, but even at lower concentrations there was still a hampering effect on thrips movements.

In the series of fruits subjected to similar handling with talc, the dust concentration on the fruits in the several groups was as follows:—

Series of Fruits.	Concentration at Initiation.
1	350-400
2	200-250
3	150-175
4	125-150
5	100-125
6	50-75
7	Below 50

Only fruits in series 1 showed an entire absence of rusting on the dusted surface. Series 2 and 3 were transitional, the thrips tending to break across the margin between dusted and undusted parts of the surface. Attenuation of the dust cover below this point allows more or less free movement of the insect until in series 6 and 7 the dust covers had little or no influence on the activities of the insect. As some slight breakdown took place in series 2, the higher concentration 250 is accepted as the limit to the thrips activity on dusted surfaces. In terms of particle concentration this would be 10,000 particles per square centimetre of surface.

EXPLANATION OF PLATES 1 AND 2.

Diagrammatic drawings from sketches made in the course of one laboratory experiment. In each case the end marked "A" of the fruit was in darkness and the end marked "B" was exposed to light. End "A" of all treated fruit was dusted with kaolin to the median line, end "B" being undusted. The left hand illustration of each pair shows the upper surface as the fruit lay in the tube, the right shows the under surface.

The shading indicates the outlines of thrips pasturage and is heavier where the rusting was more severe.

PLATE 1.

I. Untreated fruit.

II. Dusted, series 1; concentration white.

III. Dusted, series 2; concentration 300 per magnified sq. cm.

IV. Dusted, series 3; concentration 250 per magnified sq. cm.

PLATE 2.

I. Dusted, series 4; concentration 150 per magnified sq. cm.

II. Dusted, series 5; concentration 100 per magnified sq. cm.

III. Dusted, series 6; concentration 75 per magnified sq. cm.

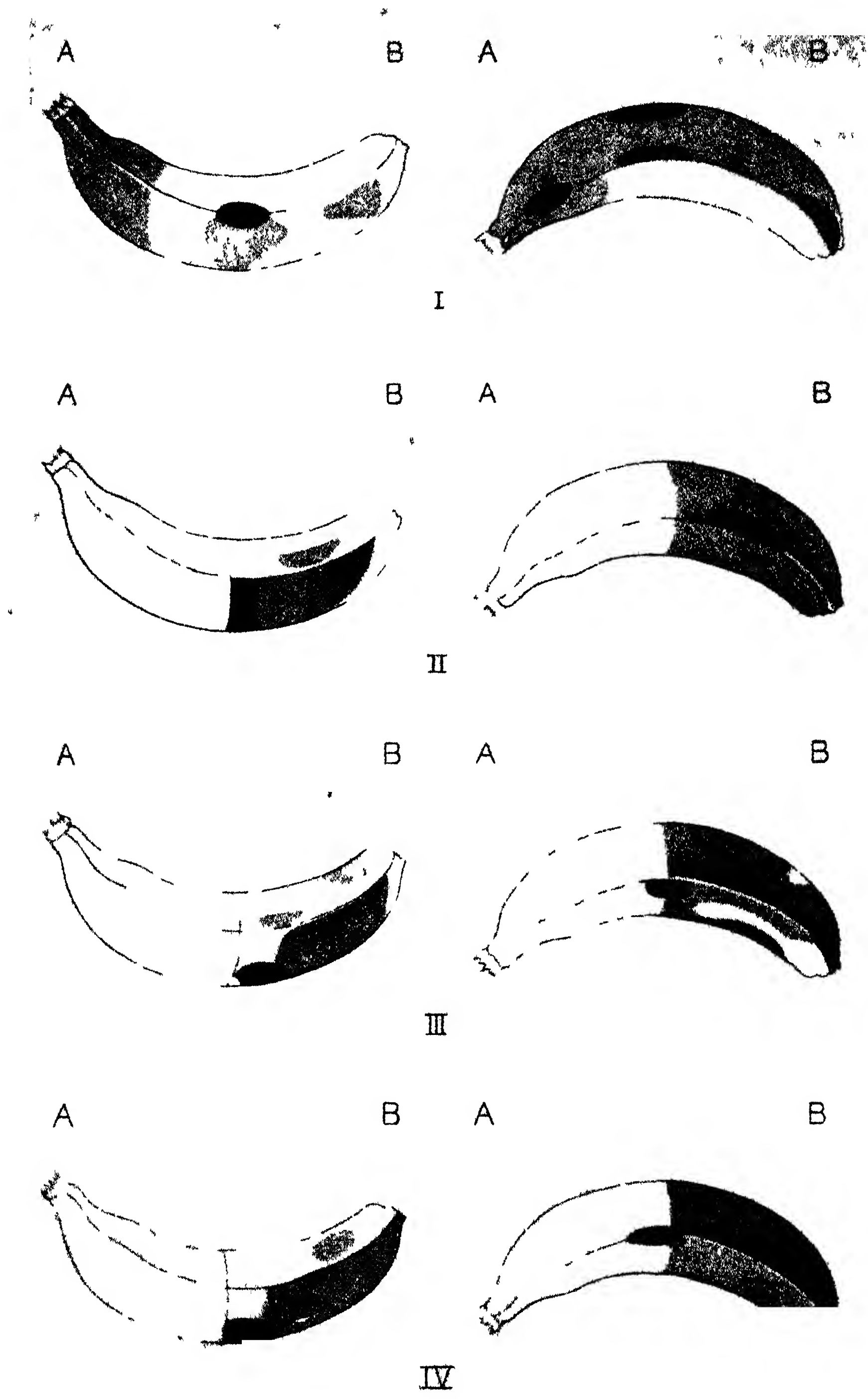

PLATE 1

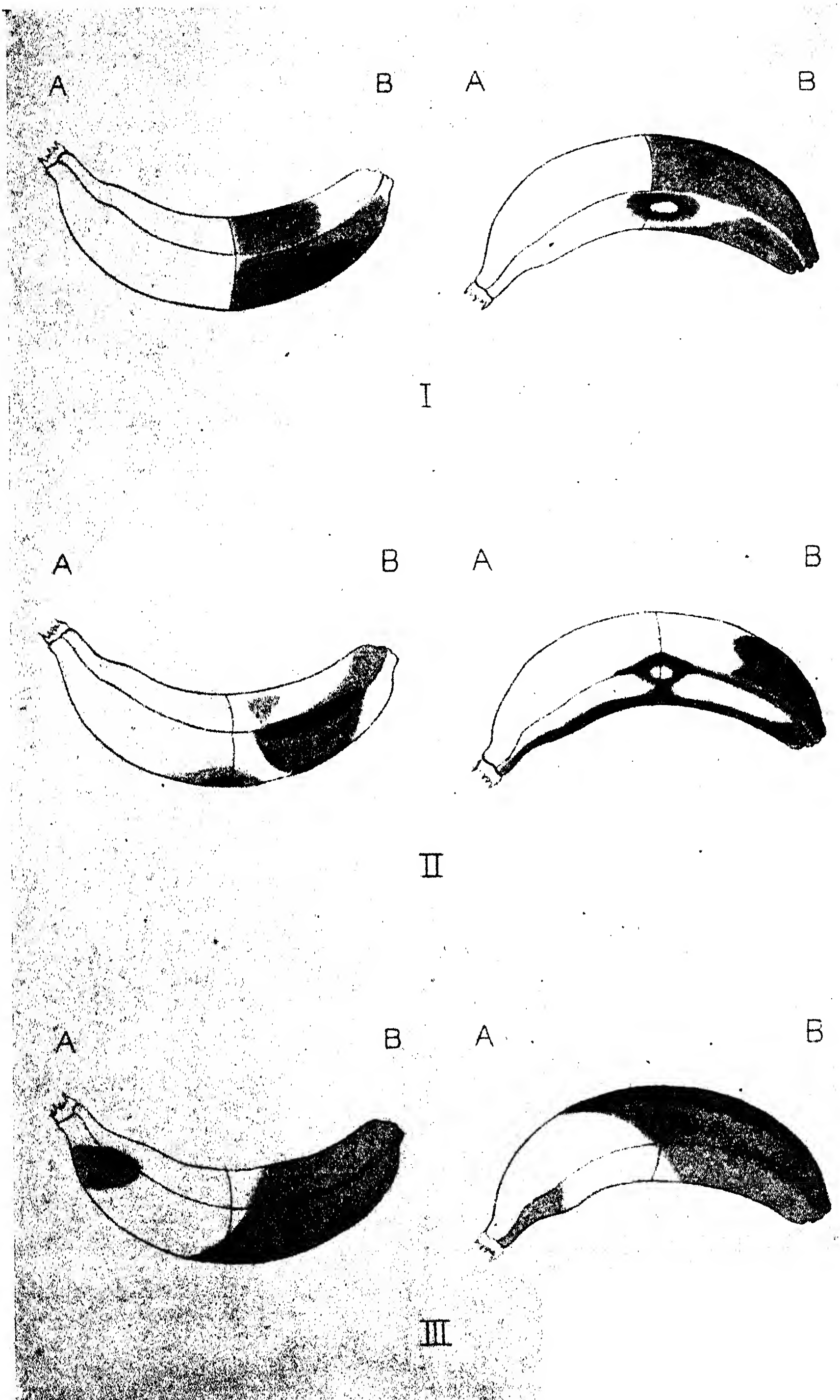

PLATE 2.

APPENDIX III.

THE UTILITY OF SULPHUR DUSTS.

Laboratory Experiments, 1929-30.

(*a*) Sublimed sulphur: Colonies were established on dusted fruits in confinement, 13th February, 1930. No obvious restriction on colony formation; little mortality during the first week and no inhibition of rust development. Eggs hatched normally after the usual period of incubation. After one month, the adults were dead but the colonies were intact, being made up of larvæ in the first introduced series and others hatched from eggs deposited in the fruit by introduced adults.

(*b*) Precipitated sulphur: Colonies were established on fruits, 18th March, 1930 Larvæ tended to wander from the fruit on to the glass, and all were dead within a week though some of the adults persisted. Eggs were laid by these, but none emerged except in the more lightly dusted fruits, where the increase in the larval population took place in the third week, *i.e.*, a fortnight after the same phenomenon in the checks. Rusting of any consequence took place only in the checks and lighter dusted fruits and then only towards the end of the observation period.

Preliminary Field Experiments, Edgehill, 1929-30.

(*a*) Sublimed sulphur, alone and in association with Cloudform tobacco dust, in proportions of 1 to 4. In the former no toxicity was observed, while in the latter case the effect was similar to that noted when the tobacco dust was used alone, *i.e.*, an immediate reduction in the existing thrips population followed by re-establishment some two or three weeks later from migratory individuals and young hatched from eggs in the fruit.

(*b*) Precipitated sulphur alone created conditions unfavourable to thrips activity on the bunch, hence the migratory but not necessarily fatal movements which follow dust applications. Adults showed a greater survival value than the larvæ, and egg-laying was not inhibited, though emergences did not take place as they otherwise did in the checks. In combination with tobacco dust in the proportions of 2 to 3, the thrips fauna was reduced to negligible proportions on the initial application. No trace of egg emergence at a later date. Reinfestation depended on the repopulation of the bunch some considerable time later. Normal emergences from the eggs took place towards the end of the observation period of five weeks.

Experimental material comprised 100 bunches in five rows, one of which was reserved for check observations.

It would appear from the above that the mixture of fine-grade precipitated sulphur with tobacco dust showed some possibilities for the control of the pest. Restocking of the bunch may occur from two sources, surviving adults or migratory forms from other parts of the plant. It appears that any eggs present in the fruit at the time of dusting, or laid shortly after dusting, do not hatch, or that the larvæ do not survive after hatching. Hence it must be supposed that adults which persist on the

dusted fruits continue to lay eggs, which first hatch successfully when the dust concentration falls below the toxic point.

Field Experiments, Little Mulgrave, 1930-31.

The plantation was located in the valley of the Little Mulgrave River, among the foothills of the fringing range on red volcanic soil. These soils carry a light rain forest. They possess little or no distinctive subsoil near the surface, and their moisture-retaining capacity is consequently low. At the inception of the work some 8 acres, planted in January, 1930, were coming into bearing, and actual observations extended from December, 1930, to June, 1931. The two areas selected for special treatments were chosen for their apparent uniformity. The aspect of the plantation was southerly and the general lay-out was as follows:—

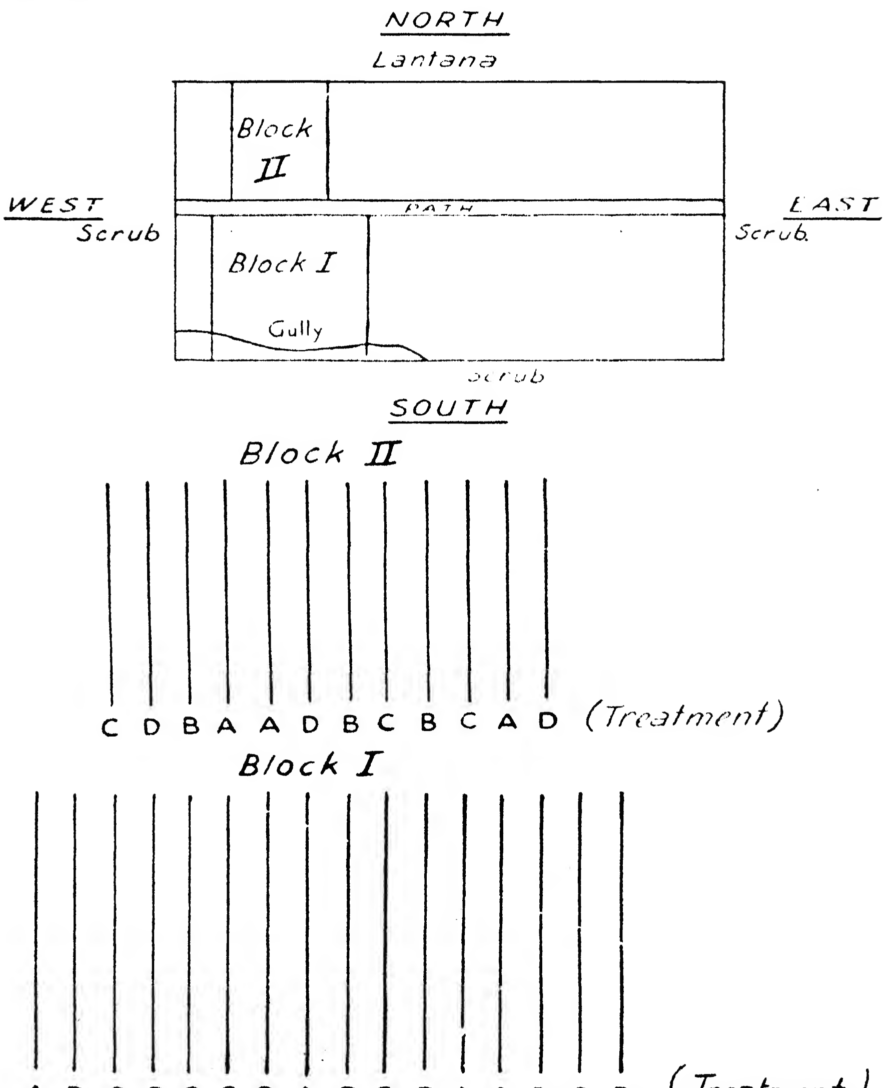

PLATE 3.

Treatments.—A: Precipitated sulphur; B: Check, untreated; C: Precipitated sulphur, plus Nicodust in proportions 1-2 respectively; D: Nicodust

Block I—Treated approximately at intervals of one week on the following dates:—December 16th, December 22nd, and December 30th, 1930, January 4th, January 12th, January 18th, January 26th, February 2nd, February 8th, February 15th, and February 21st, 1931.

Block II.—Treated approximately at intervals of two weeks on the following dates:—December 16th, and December 30th, 1930; January 12th, January 26th, February 8th, and February 21st, 1931.

In the following tables the date of bunching recorded is actually the date on which bunches thrown during the previous week were first marked Bunches listed under "Pre. Dec. 10" were thrown earlier than December 3rd.

Block I—Weekly Treatments

Date of Bunching	Nicodust		Nicodust Precipitated Sulphur		Precipitated Sulphur		Check.	
Pre—10 December	1 33	(9)	1 5	(16)	1 5	(16)	2 24	(25)
10 December	1 16	(6)	2 0	(9)	2 0	(6)	2 0	(5)
16 December	1 125	(8)	1 9	(8)	2 5	(6)	2 0	(5)
22 December	1 2	(5)	1 4	(7)	1 8	(5)	2 0	(9)
30 December	1 22	(9)	1 3	(7)	1 78	(9)	2 0	(8)
4 January	1 5	(8)	1 44	(9)	2 4	(10)	2 17	(7)
11 January	2 0	(2)	2 1	(7)	2 7	(7)	3 0	(12)
18 January	2 7	(10)	2 0	(3)	3 3	(3)	4 0	(2)
24 January	3 0	(4)	3 3	(3)	3 0	(2)	4 0	(5)
2 February	2 0	(1)	2 5	(2)	3 0	(1)	3 0	(2)
8 February	2 0	(1)	2 5	(2)	2 0	(2)	3 0	(2)
15 February	2 0	(2)	2 0	(2)			2 0	(1)

Values according to the scheme—A, 1, B, 2, C, 3, D, 4.

Numbers in brackets indicate the bunches thrown on the date cited and used in estimating the assigned value

Block I—Nicodust

Date of Bunching	Row 4				Row 5				Row 11				Row 14				Aggregates.			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Pre—10 December		1		–	1	1	–	–	3	1			2	1	–	–	6	4	-	-
10 December	1		–		–	–	–	–	2	–	–	–	2	1	–	–	5	1	–	–
16 December	1			–	4	–	–	–	–	–	–		2	1	–	–	7	1	–	
22 December	–		–	–	1	–	–	–	2	1	–	–	1	–	–	–	4	1	–	–
30 December	3	1	–	–	1	–	–	–	1	1	–	–	2	–		–	7	2	–	
4 January	4	2	–	–	–	1		–	–	1	–	–		–	–	–	4	4	–	–
11 January		–		–	–	2	–	–	–		–	–	–	–	–	–	–	2	–	–
18 January	–	1	–	–	–	3	4	1	–	–	1	–		–	–	–	–	4	5	1
24 January	–	–	4	–	–		–	–	–	–	–	–		–	–	–	–	–	4	–
2 February	–	–		–	–	–	–	–	–	1	–	–	–	–	–	–	–	1	–	–
8 February		1		–	–	–	–	–	–	–	–	–			–	–	–	1	–	–
15 February	–	1	–		–	–	–	–	–	1	–	–		–	–	–	–	2	–	–
																	33	23	9	1

Assigned values—A, 1 B, 2, C, 3, D, 4. Total rust incidence, 110, number of bunches, 66 rust incidence per bunch, 1 7

Block I—Nicodust and Precipitated Sulphur, 2 1

Date of Bunching	Row 3				Row 6				Row 10				Row 15				Aggregates.			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Pre—10 December	1	2	–		2	–	–	–	2	2	1	–	4	2	–	–	9	6	1	–
10 December	1	–			–	2	–	–	–	2	–	–	–	3	1	–	1	7	1	–
16 December		–	–	–	1	1	–	–	–	2	–	–	–	4	–	–	1	7	–	–
22 December	2	–	–	–	1	-	–	–	1	3	–	–		–		–	4	3	–	–
30 December	–	1	–		1	–	–	–	4	1	–	–		–	–	–	5	2	–	–
4 January	3	3	–		1	–	–	–	1	–	–		–	1	–	–	5	4	–	-
11 January	–	3	–	–	–	1	1	–	–	1	–	–	–	1	–	–	–	6	1	
18 January	–	1	1		–	–	–	–	–	–	1	–	–	–	–	–	–	1	2	
24 January	–	–			–	–	–	2	–	1	–	–			–	–	–	1	–	2
2 February	1	–	–	–	–	–	–	1	–	–	–		–	–		–	1	–	–	1
8 February	–	–	–	–	–	1	1	–	–	–	–	–			–	–	–	1	1	–
15 February	1	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1	–	1	–
																	27	38	7	8

Assigned values—A, 1, B, 2; C, 3; D, 4. Total rust incidence, 136; number of bunches, 75; rust incidence per bunch, 1 8.

Block I.—Precipitated Sulphur.

Date of Bunching.	Row 1.				Row 8.				Row 12.				Row 13.				Aggregates.			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Pre—10 December ..	–	–	–	–	2	3	–	–	4	4	–	–	2	1	–	–	8	8	–	–
10 December ..	–	1	–	–	–	–	–	–	–	3	–	–	–	2	–	–	–	6	–	–
16 December ..	–	1	–	–	–	1	1	–	–	–	–	–	–	1	2	–	–	3	3	–
22 December ..	–	–	–	–	1	1	–	–	–	3	–	–	–	–	–	–	1	4	–	–
30 December ..	–	2	–	–	–	2	–	–	–	2	–	–	1	2	–	–	1	8	–	–
4 January ..	–	3	1	–	–	2	1	–	–	1	2	–	–	–	–	–	–	6	4	–
11 January ..	–	2	1	–	–	–	1	–	–	–	–	–	–	–	3	–	–	2	5	–
18 January ..	–	–	1	1	–	–	1	–	–	–	–	–	–	–	–	–	–	–	2	1
24 January ..	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–
2 February ..	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1	–
8 February ..	1	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	1	–
																	11	37	18	1

Assigned values—A, 1; B, 2; C, 3; D, 4. Total rust incidence, 143, number of bunches, 67; rust incidence per bunch, 2·1.

Block I.—Check Rows.

Date of Bunching.	Row 2.				Row 7.				Row 9.				Row 16.				Aggregates.			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Pre—10 December ..	–	1	1	–	2	4	2	–	–	4	2	1	2	4	1	1	4	13	6	2
10 December ..	–	–	–	–	–	3	–	–	–	1	–	–	–	1	–	–	–	5	–	–
16 December ..	–	1	1	–	–	–	1	–	–	2	–	–	–	–	–	–	–	3	2	–
22 December ..	–	2	1	–	–	2	1	–	–	3	–	–	–	–	–	–	–	7	2	–
30 December ..	–	4	–	–	–	–	–	–	–	1	–	–	–	3	–	–	–	8	–	–
4 January ..	–	1	1	–	–	1	1	–	–	1	–	–	–	2	–	–	–	5	2	–
11 January ..	–	1	–	–	–	–	2	1	–	–	1	1	–	1	5	–	–	2	8	2
18 January ..	–	–	–	–	–	–	–	1	–	–	–	1	–	–	–	–	–	–	–	2
24 January ..	–	–	3	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	3	2
2 February ..	–	–	–	1	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1	1
8 February ..	–	–	–	–	–	–	–	–	–	–	1	–	–	–	1	–	–	–	2	–
15 February ..	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1	–	–
																	4	44	26	9

Assigned values—A, 1; B, 2; C, 3; D, 4. Total rust incidence, 206; Number of bunches, 83; rust incidence per bunch, 2·5.

Block II.—Fortnightly Treatments.

Date of Bunching.	Nicodust.		Nicodust Precipitated Sulphur.		Precipitated Sulphur.		Check.	
Pre—10 December	2·6	(39)	2·4	(36)	2·7	(38)	1·9	(32)
10 December	2·0	(6)	1·9	(16)	2·2	(18)	1·9	(15)
16 December	2·0	(4)	1·75	(4)	2·0	(4)	1·9	(8)
22 December	1·5	(8)	1·5	(2)	1·7	(7)	1·9	(7)
30 December	1·7	(10)	1·5	(13)	1·6	(10)	1·5	(8)
4 January	1·6	(7)	2·0	(10)	1·9	(9)	2·0	(7)
11 January	2·3	(6)	2·5	(4)	2·3	(7)	2·5	(2)
18 January	2·0	(2)	4·0	(1)	3·0	(5)	2·5	(2)
24 January	3·0	(5)	3·3	(3)	3·4	(5)	3·5	(2)
2 February	2·5	(2)	3·5	(2)	..		4·0	(3)
8 February	..		1·75	(4)	3·0	(1)	..	

Values according to the scheme—A, 1; B, 2; C, 3; D, 4.

The numbers in brackets indicate the bunches thrown on the date cited and used in estimating the assigned value.

Block II.—Nicodust.

Date of Bunching.	Row 2.				Row 6.				Row 12.				Aggregates.			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Pre—10 December	1	4	1	1	1	10	3	7	–	5	4	2	2	19	8	10
10 December	3	–	–	1	–	–	–	1	1	–	–	–	4	–	–	2
16 December	1	–	–	–	–	1	–	–	–	1	1	–	1	2	1	–
22 December	1	3	–	–	3	–	–	–	1	–	–	–	5	3	–	–
30 December	1	1	–	–	–	–	–	–	2	6	–	–	3	7	–	–
4 January	2	–	–	–	1	2	–	–	–	2	–	–	3	4	–	–
11 January	–	3	–	–	–	–	–	–	–	1	2	–	–	4	2	–
18 January	–	–	–	–	–	–	–	–	1	–	1	–	1	–	1	–
24 January	–	–	3	–	–	1	–	1	–	–	–	–	–	1	3	1
2 February	–	–	–	–	–	–	1	–	–	1	–	–	–	1	1	–
													19	41	16	13

Assigned values—A, 1; B, 2; C, 3; D, 4. Total rust incidence, 201; number of bunches, 89; rust incidence per bunch, 2·3.

Block II.—Nicodust and Precipitated Sulphur, 2 : 1.

Date of Bunching.	Row 1.				Row 8.				Row 10.				Aggregates.			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Pre—10 December	–	8	7	–	1	10	2	2	–	1	4	1	1	19	13	3
10 December	1	2	–	–	3	3	–	–	–	5	2	–	4	10	2	–
16 December	1	–	–	–	–	2	–	–	–	1	–	–	1	3	–	–
22 December	1	–	–	–	–	–	–	–	–	1	–	–	1	1	–	–
30 December	3	2	–	–	2	2	–	–	2	2	–	–	7	6	–	–
4 January	–	4	–	–	1	4	–	–	–	–	1	–	1	8	1	–
11 January	–	–	2	–	–	2	–	–	–	–	–	–	–	2	2	–
18 January	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1
24 January	–	–	–	–	–	–	–	–	–	1	1	1	–	1	1	1
2 February	–	–	–	1	–	–	1	–	–	–	–	–	–	–	1	1
8 February	–	–	–	–	–	–	–	–	1	3	–	–	1	3	–	–
													16	53	20	6

Assigned values—A, 1; B, 2; C, 3; D, 4. Total rust incidence, 206; number of bunches, 95; rust incidence per bunch, 2·2.

Block II.—Precipitated Sulphur.

Date of Bunching.	Row 4.				Row 5.				Row 11.				Aggregates.			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Pre—10 December	1	9	6	2	–	4	3	4	1	2	3	3	2	15	12	9
10 December	–	8	2	1	–	3	–	–	1	3	–	–	1	14	2	1
16 December	–	1	–	–	–	2	–	–	–	1	–	–	–	4	–	–
22 December	–	3	–	–	2	1	–	–	1	1	–	–	3	5	–	–
30 December	–	1	–	–	–	3	–	–	4	2	–	–	4	6	–	–
4 January	1	2	–	–	1	1	1	–	–	3	–	–	2	6	1	–
11 January	1	1	2	–	–	1	1	–	–	1	–	–	1	3	3	–
18 January	–	–	–	–	–	1	1	1	–	–	2	–	–	1	3	1
24 January	–	–	1	–	–	–	2	1	–	–	–	1	–	–	3	2
2 February	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
8 February	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1	–
													13	54	25	13

Assigned values—A, 1; B, 2; C, 3; D, 4. Total rust incidence, 248; number of bunches, 104; rust incidence per bunch, 2·4.

Block II.—Check Rows.

Date of Bunching.	Row 3.				Row 7.				Row 9.				Aggregates.			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Pre—10 December	–	4	2	–	2	9	3	–	1	6	4	1	3	19	9	1
10 December	1	5	1	–	1	3	–	–	1	2	1	–	3	10	2	–
16 December	1	2	–	–	–	3	–	–	–	2	–	–	1	7	–	–
22 December	2	1	–	–	–	1	–	–	–	3	–	–	2	5	–	–
30 December	1	1	–	–	2	3	–	–	1	–	–	–	4	4	–	–
4 January	–	3	–	–	–	3	–	–	–	1	–	–	–	7	–	–
11 January	–	1	–	–	–	–	1	–	–	–	–	–	–	1	1	–
18 January	–	1	–	–	–	–	1	–	–	–	–	–	–	1	1	–
24 January	–	–	–	–	–	–	–	–	–	–	1	1	–	–	1	1
2 February	–	–	–	1	–	–	–	–	–	–	–	2	–	–	–	3
													13	54	14	5

Assigned values—A, 1; B, 2; C, 3; D, 4. Total rust incidence, 183; number of bunches, 86 rust incidence per bunch, 2·1.

APPENDIX IV.

MODIFICATIONS OF THE DUSTING APPARATUS.

The dusting of the banana bunch presents problems quite different from those associated with the treatment of other crops. With the banana bunch the object to be dusted is at or about chest level, and the dust must be applied from all sides if the various faces of the bunch are to be covered. The operator himself cannot very well move round the bunch, and has therefore to project the dust towards himself when treating the fruit furthest away from him. This is practicable with small plunge dusters, but these, though perhaps suitable for small areas where time and convenience are of small moment, are quite inadequate for general plantation use. Large rotary dusters provide very satisfactory motive power, but most makes on the market have a rigid arm made up of sectional tubes which fit into one another. Some have a semi-flexible feed arm, but the construction is heavy.

For the banana bunch treatment, the duster requires adequate motive power and a feed arm which can be readily manipulated by the operator. In the rotary duster available, the feed arm consisted of three sections fitting into one another. The first two of these were dispensed with in the modification, and a specially prepared flexible tube made of duck and supported by a spiral steel wire was substituted. The length of the flexible tube was kept at a minimum—in practice some 15-18 inches.

The procedure is simple. Either 12 or 14 gauge steel wire is carefully twisted round an inch bar carried on the frame of a lathe in such a way that neighbouring coils touch each other. When a coil of some 8 inches is wrapped round the bar, it is liberated with the greatest possible care. When relaxed the steel wire cylindrical spring has a diameter of 1¾ inches. The ends of the spring are pulled apart until adjacent coils are ¾ inch apart, and trimmed to a length of 15-18 inches. A sleeve is made to fit the spring, heavy duck or some similar material sufficiently strong to stand the strain of constant use in the plantation being suitable. The free ends are then clamped in position, one to the hopper of the duster, the other to the last section of the rigid feed arm, this and the fishtail feed being retained in the modified apparatus.

In operation, the rigid section is held in the left hand, and can be manipulated at will, the dust charge being applied to the various parts of the bunch with the minimum inconvenience.

SEASONAL GREETINGS ACKNOWLEDGED.

Seasonal greetings have been received by the "Queensland Agricultural Journal" from the "Courier-Mail," Brisbane; "The Producers' Review," Toowoomba; "The Fruit Culture," Agricultural Press, Ltd., Sydney; State Service Union; F. M. J. Baker, M.P.; Australian Broadcasting Commission; "Rosewood Register"; "Monto Herald"; Queensland Forestry Department; St. Joseph's College, Nudgee; Queensland Co-operative Bacon Association, Ltd., Murarrie; and numerous readers in different parts of Queensland and in other States of the Commonwealth and Mandated Territories. All greetings are warmly acknowledged and cordially reciprocated.

Australian and European Bacon.

By E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

WITH a view to affording pig raisers and trade representatives in Queensland opportunity of making a detailed comparison of the commercial quality of Australian and European bacon, the Royal National Agricultural Association of Queensland, at the recent Brisbane Exhibition, staged a display of bacon sides, such as find ready sale on the markets of the United Kingdom, where bacon and other pork products from European countries vie with home-grown products and those of the dominions for first place in the trade.

The illustrations show the sides as they were on view at the pig section of the exhibition. Following are the weights from London, as supplied by the Farmers' Co-operative Distributing Association, Limited, Brisbane, who imported the sides on behalf of the Royal National Association. The sides were smoked at Murarrie:—

WEIGHT OF SIDES FROM LONDON.

Origin.	London Invoice Weights.	Weights when Unpacked.	Smoked W
	Lb.	Lb.	Lb.
Ireland	53	50½	49
Sweden	58	54½	52½
Canada	46	43	40
Poland	56	51	49
Denmark	60	55	53
Holland	59	54½	53

The Queensland sides averaged 45 lb. smoked weights.

All the sides received similar treatment in the final stages of preparation. After being cured, the imported sides were dispatched in a frozen condition, referred to in the trade as green or unsmoked bacon—i.e., bacon that has been salted and cured, but not finally washed, dried, smoked, polished, and prepared for market.

The imported sides were thereafter subjected to these processes at the Murarrie Bacon Factory, and were finally delivered at the Exhibition, along with typical Queensland sides kindly lent for the purpose by Foggitt, Jones, Proprietary, Limited, J. C. Hutton Proprietary, Limited, and the Queensland Co-operative Bacon Association, Limited, of Brisbane.

An endeavour was made to display Queensland sides of similar weight, conformation, and condition so that a fair comparison could be made, and these are illustrated along with Irish and Canadian sides—Australia's keenest Empire competitors on the markets of the old world—Swedish, Dutch, Polish, and Danish sides of average commercial quality are also illustrated. To enable a further and more minute examination to be made, the sides were cut and the cut portion of one of each of the flitches is shown.

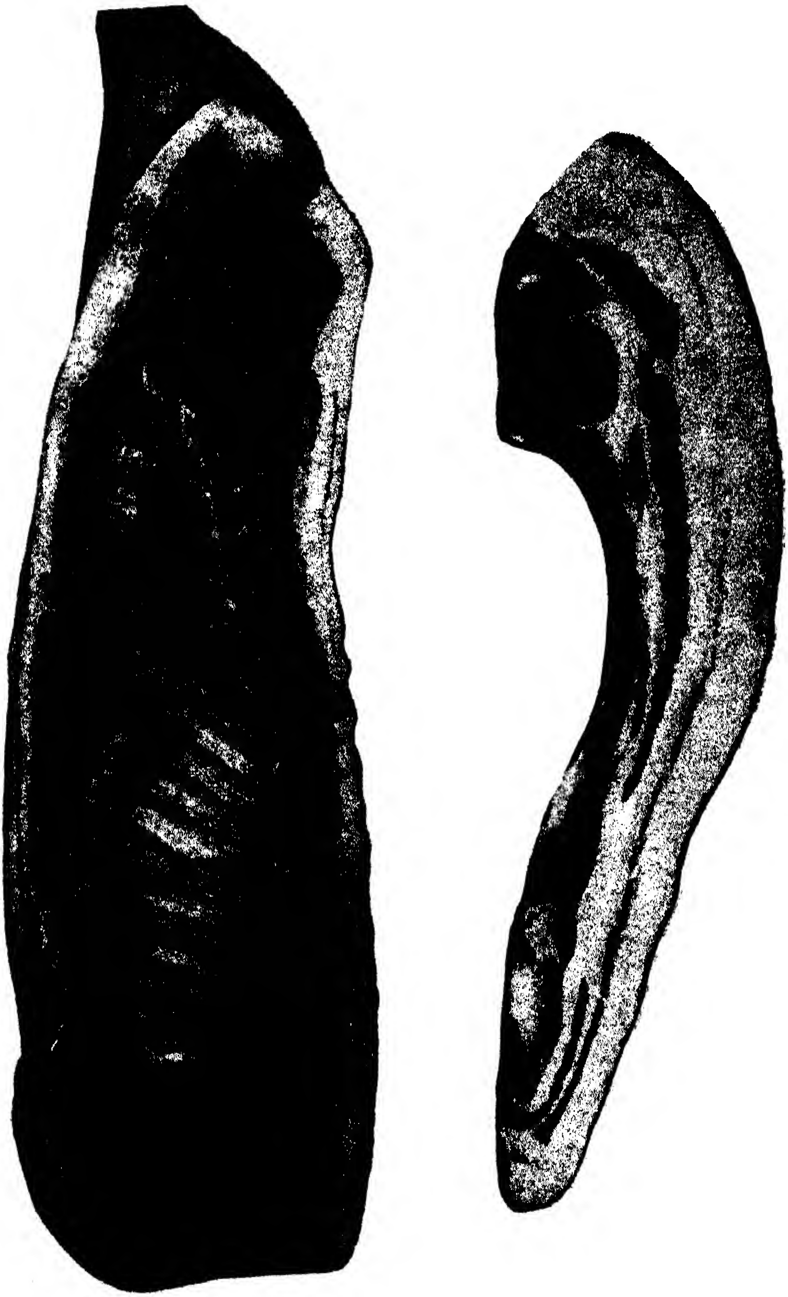

PLATE 4.—QUEENSLAND BACON.

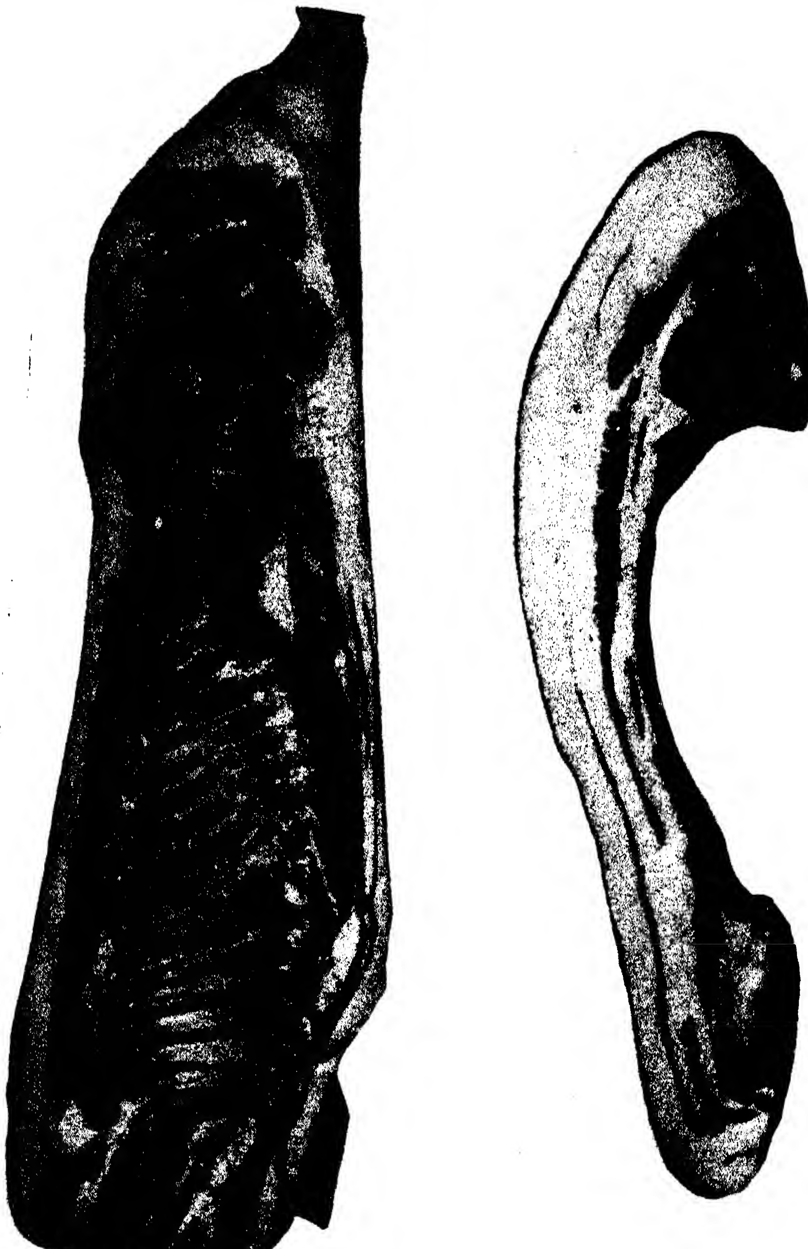

PLATE 5.—QUEENSLAND BACON.

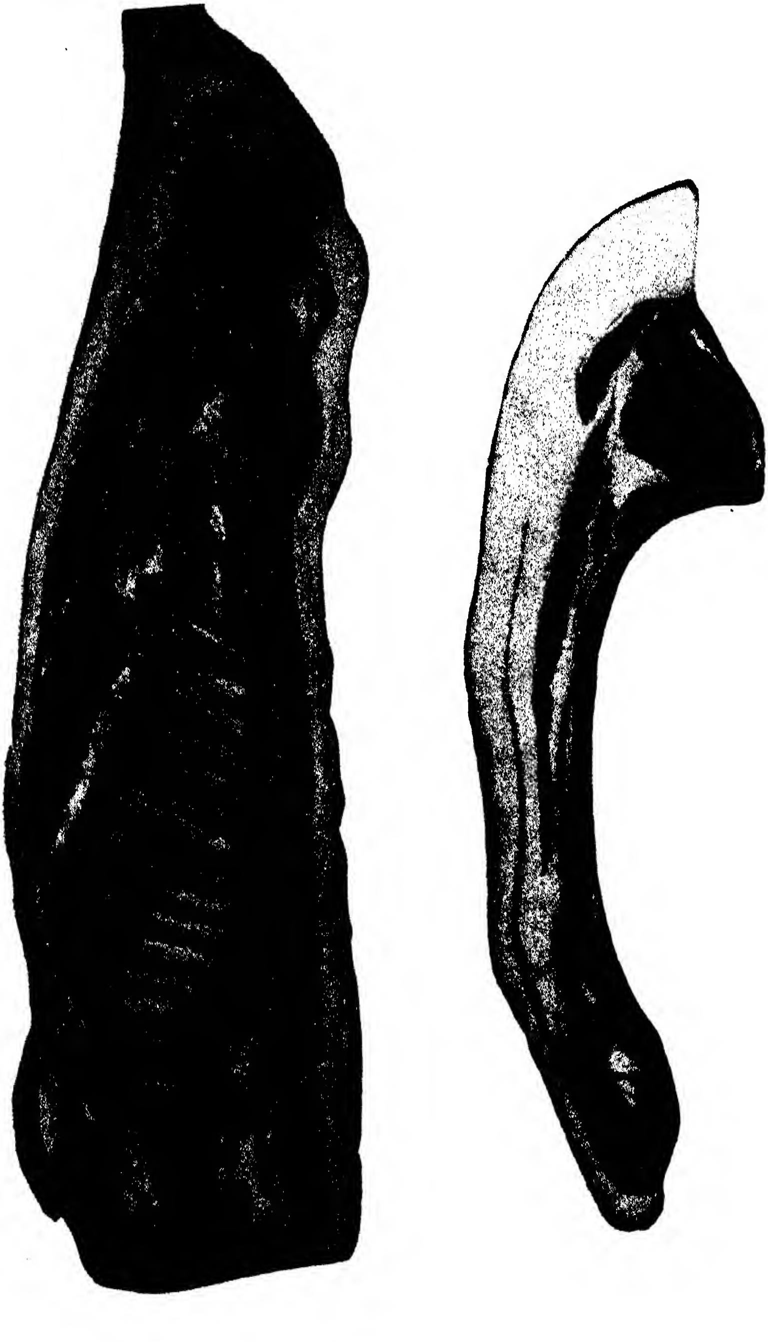

PLATE 6.—QUEENSLAND BACON.

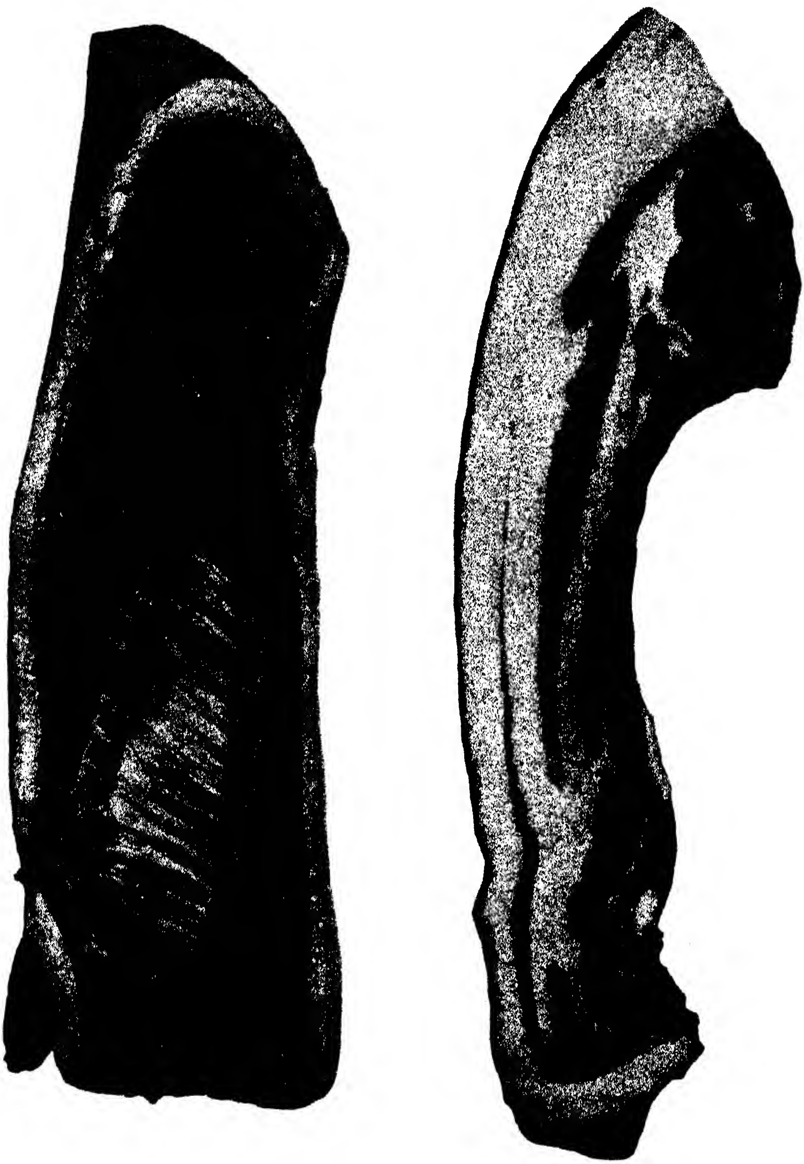

PLATE 7.—DANISH BACON.

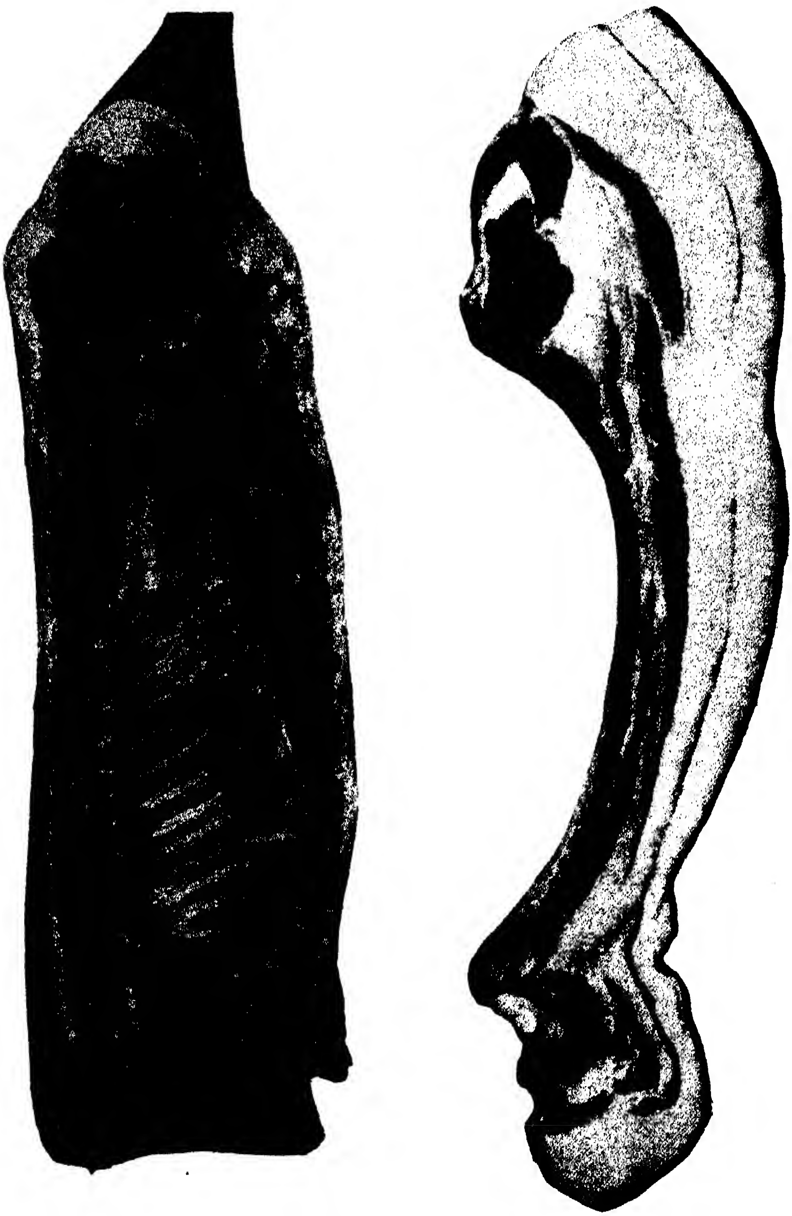

PLATE 8.—POLISH BACON.

Advices received from Great Britain in connection with consignment indicated that it was not possible to obtain bacon sides of Argentine or United States of America manufacture, as those countries are no longer sending Wiltshire long sides to Britain; nor was it possible to obtain Latvian sides, as they were not represented on the Smithfield markets.

Comment.

It was ascertained that, in regard to the Polish bacon, the feeds used in the production of the bacon sides shown included potatoes, barley, rye, and dairy products and, in smaller quantities, household refuse—all suitable for use in rations for the production of bacon pigs. In Poland, maize is used only in exceptional cases, and then exclusively in the southern districts of that country. The curing process for Polish bacon is strictly in accordance with requirements of the British Ministry of Agriculture and Fisheries. Polish pigs consist almost entirely of three groups—Landrace, improved pigs, and purebred pigs—the production of which depends on the import of stud stock from England and Germany according to breeds. The good points of the Polish Landrace is their resistance to unfavourable conditions and great fertility. As for pedigree pigs used in Poland, first place is occupied by the British Large White, and next by the German White Pointed Ear Pig (Deutsches Edelschwein). There are not many Berkshires, Large Blacks, or Westphalian pigs.

Danish Pigs.

The characteristic feature of the production of pork in Denmark is the close association of pig breeding with dairy farming. The various by-products of the dairy—skimmed milk, butter milk, and whey—are used in the feeding of pigs to the utmost extent possible, and milk is so far recognised as a basic food for pigs that its use is almost entirely regarded as obligatory. Practically all Danish farmers use cereals and milk as the sole food of the young animals. If grain prices are high, part of the cereals may be replaced by such feeds as potatoes, sugar beet, swedes, &c., but this is usually of advantage to the quality of the pork, a moderate quantity of root crops having a favourable effect on the fattening. Unduly large quantities of sugar beets and swedes may have the effect that the flesh acquires an unfavourable (soft) consistence, but as this feeding is quite uneconomical, and as the pigs are paid for according to the quality of the pork, the risk of an exaggerated use of these foodstuffs really does not arise in actual practice.

Denmark uses principally the Large White Yorkshire breed crossed with the native Landrace.

Swedish Pigs.

In Sweden pig feeding is carried on for the most part on small farms and decreases regularly with increased acreage. Next to butter, bacon is the most important article of Swedish exports in animal products. The little pigs are first supplied with other food while still suckling. For this purpose they are admitted to a smaller sty at the side of that of their dam, where they are given whole barley or rye, and later on warm fresh skim milk in small quantities. At the age of from six to seven weeks of age, the pigs are weaned. During the first weeks of transition (i.e., after weaning) fresh lukewarm cow's milk is substituted for the sow's milk. Considerable attention is paid to the cleaning of the

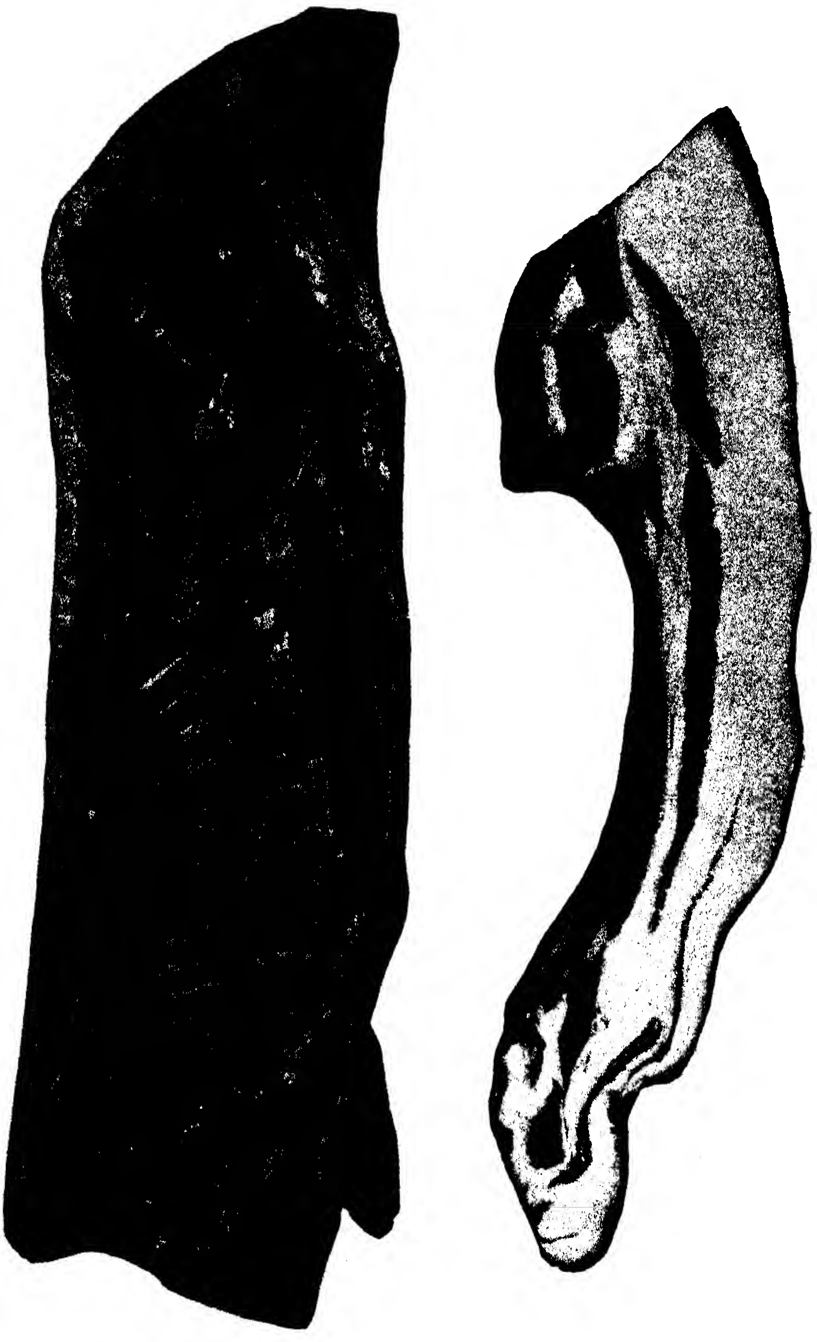

PLATE 9.—IRISH BACON.

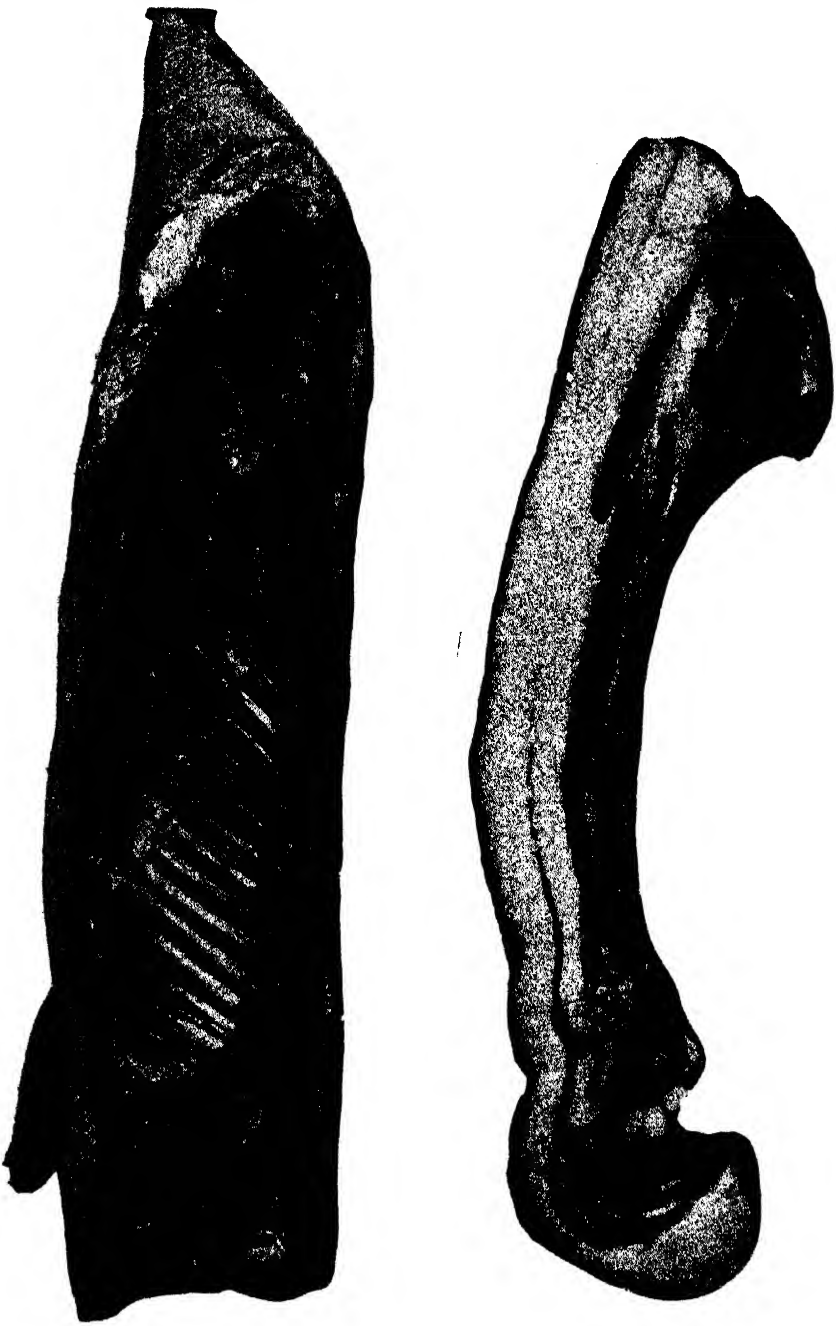

PLATE 10.—SWEDISH BACON.

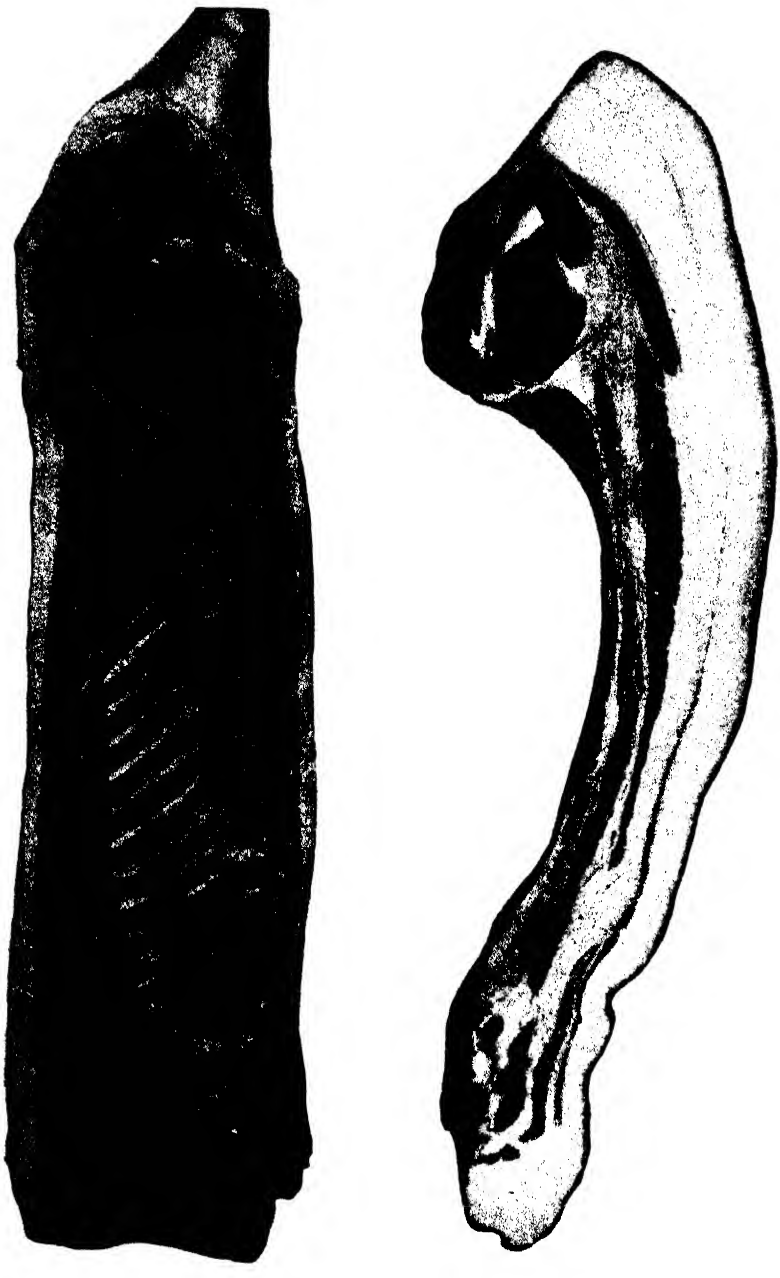

PLATE 11.—DUTCH BACON.

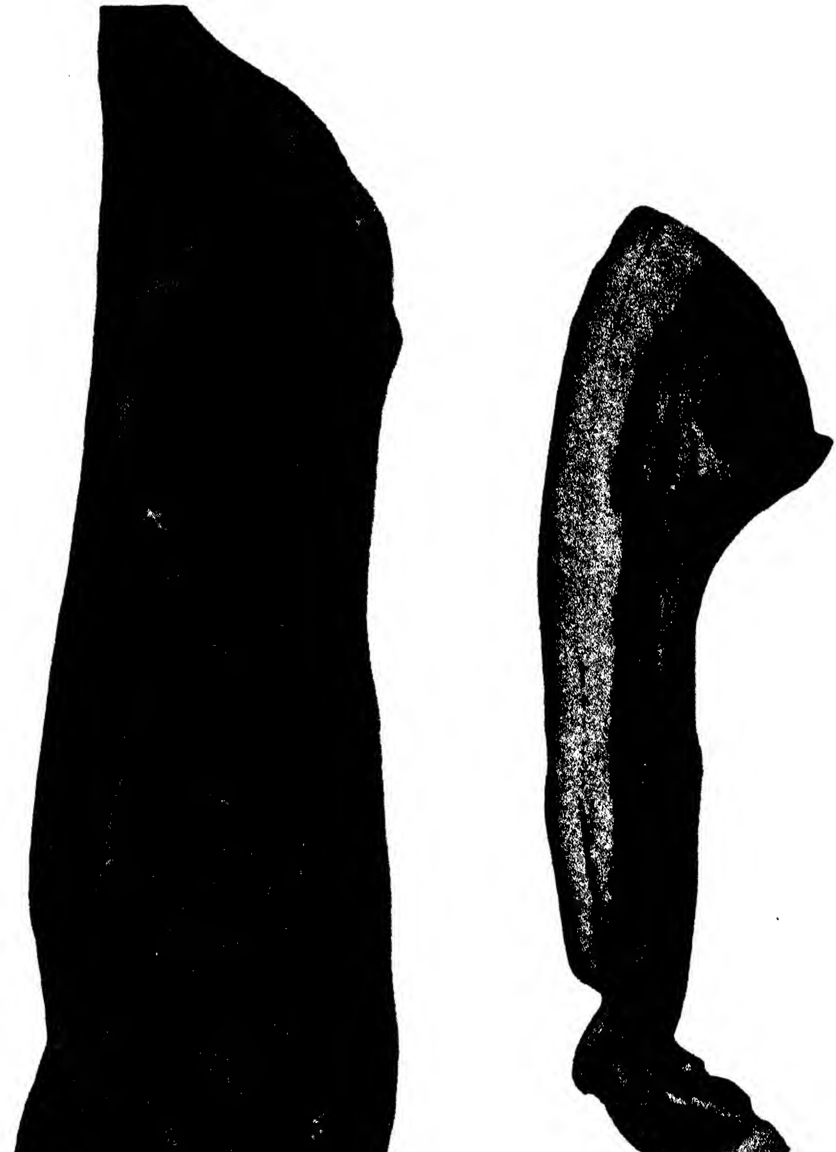

PLATE 12.—CANADIAN BACON.

troughs in order to avoid souring the food. Having reached the age of eight to ten weeks, the little pigs receive crushed or ground corn instead of whole cereals. In addition, roots or boiled potatoes often form a part of the rations. The feeding of breeding animals is given special attention.

The most prominent of the breeds used is the Large White Yorkshire, the prevailing breed in Sweden now. These and the Swedish Landrace are crossed together with excellent results. The general pig industry of the country has been largely influenced during the last decade by breeding animals emanating from breeding stations for the Large White. In this way, by means of pure breeding and very frequent cross-breeding, the Large White has influenced to a larger degree the present stock of the country. The Swedish Landrace has been developed on exactly the same lines as the Danish Landrace, with which it is closely related.

In the Netherlands.

Similar conditions prevail in the Netherlands and Holland where the Netherlands Bacon Control Office exercises a considerable influence on pig raisers.

In Canada.

Canadian Hog Grading Regulations have also largely influenced the breeding of pigs in Canada. The use of home-grown grains is recommended for the production of select bacon pigs, especially as export and domestic markets demand the production of the select bacon and bacon grades of pigs. The premium of one dollar per pig for select bacon pigs is an additional substantial profit, encouraging the farmer to produce and market the best stock possible.

In Ireland.

As is well known, some of the best pigs in the world are produced in Ireland. Irish bacon has an excellent reputation on the markets of the United Kingdom. There nothing is too good for the pig. This is in striking contrast with the keeping of pigs under rough and unhygienic conditions conducive to disease, slow growth, and no profit. In Ireland, also, the white breeds are very popular, the Large and Middle Whites being largely used on stock of local production. Milk, barley, and potatoes are foods in everyday use, while the strictest attention is given to systems of feeding and management.

COMMENT ON BACON EXHIBITED.

Points to be Noted.

It will be noted that some of the sides exhibited are of greater length than others; a closer examination will reveal that this increased length is due to an increased number of ribs. As a result of observation of a large number of pig carcasses, Professor A. M. Shaw, a noted American scientist, has shown that there is considerable variation in the number of pairs of ribs in pigs. The normal number is fourteen pairs. In some of the sides illustrated, sixteen ribs are present. Professor Shaw has observed 3,957 animals, with the following results:—20 animals had thirteen pairs of ribs each, 1,574 had fourteen pairs each, 1,829 had fifteen pairs each, 310 had sixteen pairs, and 7 had seventeen

pairs each. The remainder showed uneven pairs or floating ribs. No normal litters were found where all the pigs possessed the same rib numbers.

It is possible there is room for much research work in connection with the length of side of the pig. It might be noted that in the butchering of the sides for bacon curing, the first pair of ribs—one on each side—is invariably removed, this being a recognised practice in the trade.

It will be noted further that all sides show a reasonable uniformity in width. All the imported sides have the aitch bone removed exposing the knuckle joint in the ham. They also have the shoulder blades removed, as is required in the Wiltshire long side trade. The Queensland sides have not been dealt with in this way, as neither aitch bone nor shoulder blade is removed in curing bacon in this country.

All the sides except the Canadian carry a similar proportion of back fat, the Canadian was considered by most of those qualified to speak as being altogether too thin for best trade requirements. Actually, it cut out equal to the best, a point not to be overlooked now that the demand is for a long, lean side with a minimum of fat. Possibly it was for this reason that the Canadian side darkened more in the smoking process than the other sides. The Irish side was definitely too fat, even for the best English trade. The European sides were all typical, Swedish and Dutch sides being superior to the Polish and Danish.

The Queensland sides were very satisfactory, and on the whole made an excellent showing. Unfortunately, however, we have no record of the breed or cross represented by these sides.

The display generally was highly educational, and emphasised the importance of extension work in learning exactly what overseas markets require.

Queensland representatives who examined the sides felt that, while there is considerable room for improvement here, we are on the right lines, and now that a definite move has been made to prepare for an extensive overseas trade, such questions as length and leanness of side, uniformity, freedom from blemish, and production at a cost that will allow of a reasonable margin of profit become all the more important.

If you like this issue of the Journal, kindly bring it under the notice of a neighbour who is not already a subscriber. To the man on the land it is free. All that he is asked to do is to complete the Order Form on another page and send it to the Under Secretary, Department of Agriculture and Stock, together with a shilling postal note, or its value in postage stamps, to cover postage for twelve months.

The House Fly.

By J. A. WEDDELL, Assistant Entomologist.

THE house fly, *Musca domestica* Linn., may be rated amongst the most common insect associates of man, but familiarity with this insect has been accompanied by a corresponding ignorance of and indifference to the dangers to health that are associated with its presence. However, there is now an awakening to this danger the reality of which is indicated by the fact that the names "disease carrier" and "typhoid fly" have been suggested as substitutes for the somewhat innocent-sounding name of "house fly." This article discusses briefly the life-history and habits of the house fly, and points out the various recognised measures which may be adopted for its control.

Distribution.

The house fly is widespread throughout the world; it is present in every continent, and has been found not only in the tropical and temperate zones, but even in subpolar regions such as Lapland and Finland. Not merely is the fly widespread, but, given suitable conditions, it is capable of breeding to enormous local populations.

Life-cycle Stages.

The eggs are tiny white objects, somewhat banana-shaped and about one-twentieth of an inch in length. (Plate 13; fig. 1.)

The larva or maggot (Plate 13; fig. 2) is slender, white, and shining, and is about one-twelfth of an inch long when it hatches. The body thickens from a narrow-pointed head to a blunt and rounded anal segment. When full grown the length has increased to almost half an inch, and the colour gradually changes to a creamy shade. During the growth period the larva moults twice.

The pupal stage of the insect is passed within the final larval skin, which envelopes the insect and contracts and hardens into a cylindrical-shaped puparium with rounded ends. The colour deepens to dark-brown. The puparium is approximately one quarter of an inch in length (Plate 13; fig. 3).

A detailed description of the adult fly is rendered needless both by familiarity and because of the accompanying illustration (Plate 13; fig. 4). It is necessary to refer to only a few structures. The mouth-parts (Plate 13; fig. 5) are wonderfully complex, with a proboscis capable of extrusion for the purpose of sucking liquid food. It is incapable of piercing or chewing, but solid foot such as sugar is first dissolved by a flow of saliva and the resultant solution is then sucked up.

The tarsal joints of the legs constituting the feet are well adapted for walking either vertically or upside down on smooth surfaces. The terminal joint (Plate 13; fig. 6) has, besides two claws, two sticky pads covered with very fine hairs and furnished with glandular openings from which there exudes a sticky fluid.

The legs and body of the fly are clothed in fine hair-like spines which make the lodgment of contaminating particles almost inevitable.

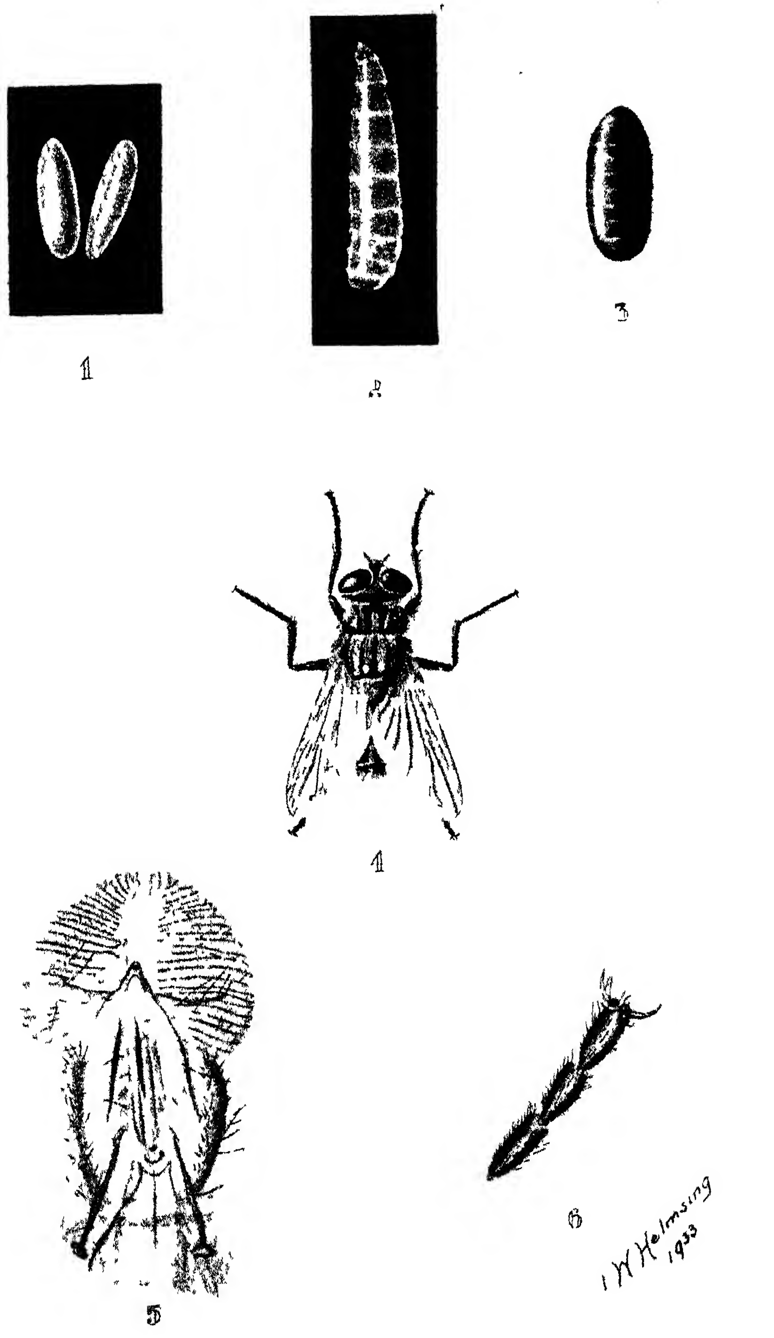

PLATE 13.—HOUSE FLY (*Musca domestica* Linn.).

Fig. 1.—Eggs × 15.
Fig. 2.—Larva × 5.
Fig. 3.—Puparium × 5.
Fig. 4.—Adult × 5.
Fig. 5.—Proboscis × 34.
Fig. 6.—Foot showing claws and pad × 34.

Life-history.

The eggs are laid in batches of about 110 to 150 eggs, in fresh manure, garbage, fæces, and decaying vegetation. They hatch usually in from 8 to 24 hours, the time varying with the temperature.

The larvæ or maggots may be found in squirming masses within a few inches of the surface of infested material, but if the material is soft and moist and not subject to excessive internal heating, the maggots may penetrate throughout. At the end of about five days in warm weather the maggots achieve full growth, and they move then to a suitable spot in which to pupate, the ideal site for pupation apparently being moderately damp soil giving easy penetration. Pupation may occur at depths varying from little more than 1 inch to 2 feet, the latter being recorded in sandy loam.

The pupal period lasts approximately three to five days in warm weather, but great variation in this period may occur according to the temperature conditions, development being slower with low temperatures.

This period constitutes the time during which the marked change from larva to adult is taking place, and it is terminated by the complete development and the emergence of the adult insect. The adult fly commences to feed soon after emergence, but egg-laying does not occur until after a lapse of ten days to a fortnight. It will be seen that a complete generation from egg-laying to egg-laying may occupy only a little over three weeks in warm weather.

Habits and Menace of the Adult Fly.

In the matter of food, the house fly has most varied tastes; moist garbage and horse manure are just as attractive as man's most carefully refined food. Further, it is essential for the fly to visit putrefying material in order to lay its eggs. As has been pointed out, contaminating material will be caught in the hairs clothing the body, and on the claws and sticky pads of the feet, and on the extruded tongue. These, taken together, constitute only one section of the danger, however. It has been definitely proved that viable bacteria capable of causing human diseases, such as typhoid and tuberculosis, among many others, may be recovered from the alimentary canal of the house fly several days after infection. This means that the familiar fly specks are potentially infective material.

Natural Control.

The fluctuations in the number of flies are largely due to variations in temperature. The high summer temperatures induce rapid breeding, and if they are accompanied by high humidities, then the breeding sites are kept suitably moist. Low temperatures increase the length of the developmental period, thus slowing up the rate of breeding, and at the same time rendering sluggish the adult flies that are present.

The house fly is subject to attack by parasitic organisms, the most notable being the fungus *Empusa muscæ* Cohn. The spores of this organism give rise to a growth of white fungus which ramifies and distends the body of the insect. Swollen, sluggish, and dead house flies will probably often have been observed by householders. The effects of the fungus are most marked in the late summer and autumn months, when large numbers of the flies are killed in this manner.

Spiders and various predatory insects such as mantids, robber flies, and wasps of various families, all take their toll of the adult house flies.

The eggs, larvæ, and pupæ are liable to attack from insects such as ants and ground beetles.

Artificial Control.

The artificial control of the house fly and the elimination of danger from it may take a threefold form:—(*a*) Exclusion; (*b*) elimination of breeding sites; (*c*) destruction of the adults.

Exclusion.

Infants and patients should be protected from the attentions of flies by mosquito nets or other comparable means of exclusion. Foodstuffs and cooking utensils should be adequately covered and suitable gauze-screened cupboards should be provided for fresh foods. Infants' food, feeding bottles, milk, and so on should be most carefully protected. In cases of severe and more or less permanent infestation of buildings by flies, serious consideration should be given to the complete screening of all doors and windows.

Elimination of Breeding Sites.

With the growth of motor transport, the number of stables in city areas tends to decrease, and in those that remain the breeding of flies is now less possible than formerly because stable owners must take suitable precautions to prevent accumulations of manure.

There are, however, instances where manure must be stored for short periods, and it has been found that heaps of manure, if closely packed, become so heated by the processes of fermentation and permeated by the resultant gases that fly-breeding is restricted to the outermost layer of an inch or so. The heaps should be formed into a compact, almost rectilineal shape, and carefully smoothed on the sides and top by blows with the back of a shovel. The use of a borax spray composed of 1 lb. of borax in 6 gallons of water will satisfactorily deal with the insects breeding in the outer layer. As excess borax in the soil is injurious to plant growth, it has been recommended that not more than three gallons of this spray should be applied to 10 cubic feet of infected manure, and not more than 15 tons of borax-treated manure per acre be distributed in the soil.

For mounted army forces and farms, the method of drying manure may be useful. The process simply consists of spreading the manure in a thin uniform layer so that it dries quickly in the sun, thus rendering it unsuitable to the fly for oviposition. An area of flat hard ground should be selected and a rotation of freshly-placed manure, dry manure, and bare ground could be kept up in order to deal with fresh accumulations. The drying manure should be raked over. When dried the manure could be stored safely for agricultural purposes. It will be understood, however, that manure dried in this manner would have a diminished fertilising value, and it would be useful mainly because of the humus it would provide.

In city areas, the control of the house fly generally depends on the care taken in garbage disposal, and garbage should accordingly be placed in a fly-proof garbage tin. Regulations regarding the building

and care of household conveniences are in force, and each householder should see that so far as he is concerned, the regulations are strictly obeyed.

Destruction of the Adults.

The adult flies that gain access to a building may be dealt with in a variety of ways, as for example swatting, the use of sticky fly-papers, fly sprays, and trapping.

There are several brands of fly sprays on the market, and these generally consist of definite contact insecticides, which kill either on actually wetting the insect or as partial fumigants as a result of the fumes that are liberated when the fluid is sprayed in a fine mist.

A home-made spray may be somewhat inexpensively prepared by stable owners and farmers. The recipe is as follows:—½ lb. of pyrethrum is stirred into 1 gallon of kerosene and the mixture is agitated at intervals for two hours. Settling is then allowed to take place and the resultant clear amber-coloured fluid is later decanted or syphoned off. This spray fluid, if prepared with water-white kerosene, may be safely sprayed in furnished rooms. Householders, however, will usually find it more convenient to purchase one of the ready-prepared sprays.

It is advisable to sweep up and burn the flies that fall as a result of spraying, as a number of them may merely be stupified and, if left, may later recover.

Traps of a multiplicity of designs have been used for house fly control, the most commonly known type being the glass bottle trap with the entrance in the bottom and with an internal trough. The trough holds a fluid which serves both to lure the flies into the trap and also to drown them. Various fluids may be used for baiting this style of trap, including milk and stale beer.

Trapping should, however, be a somewhat needless procedure, or at least it is a method to be adopted only as a last resort. If flies are sufficiently numerous in a building to warrant the use of traps, then all efforts should be directed to the elimination of the source of the flies and, if necessary, to the adequate screening of the building.

Worms in Sheep.

A NEW AUTOMATIC DRENCHER.

Drenching sheep for worms has become so general in parts of Queensland that people using their ingenuity to simplify the operation deserve every possible encouragement. There has been invented an improved gun called the P. D. J. Automatic Gravity Drencher, which gives every satisfaction. The gun is simple in construction, and does its work well. The feed is by gravitation. Subjoined is a description of the new drencher, which is sure to interest sheep men, especially those engaged in lamb-raising.—Ed.

A NEW type of drenching gun for the treatment of worms in sheep is now on the market, and its efficacy has been proved by a comprehensive series of practical demonstrations. Officers of the Sheep and Wool Branch are impressed with its usefulness as an essential part of the ordinary veterinary equipment of a well-managed sheep farm, especially in those districts where lamb-raising is extensively practised.

The new gun is the invention of a veterinary surgeon, and is an improvement on any model so far used in Queensland. It is entirely a Queensland invention and product manufactured in Brisbane. The complete outfit consists of a nickel-plated copper container, a connecting tube, and the gun itself. The container is sold in two sizes, one holding half a gallon and fitted with a flexible tubing, and the other holding a gallon fitted with a rubber hose connection. In the design special attention has been given to the filter caps and shut-off taps. The aim of the designer was to evolve an instrument scientifically accurate, with the force of ejection controlled by trigger pressure, and in this he has succeeded. The gun recharges automatically on the release of the trigger and a fresh dose is sucked in to an accurately adjustable quantity. The dosage is regulated by means of a knurled screw-head at the butt of the gun—a simple arrangement by which an accurate dosage may be administered to the affected sheep.

The registered name of the new outfit is the " 'Ject-in' Sheep Drenching Gun," otherwise known as the "P.D.J. Automatic Gravity Drencher." The smaller size is intended for the administration of carbon tetrachloride or tetrachlorethylene and has a dosage range of from five to ten cubic centimetres. The larger size is designed for the administration of copper sulphate or arsenical drenches, and can be adjusted easily to a dose of either one or two ounces.

The new drencher combines the two essential features of such an apparatus—accurate dosage and ease of use. Altogether the "Ject-in" gun is one of the most satisfactory we have yet seen for the purpose of drenching sheep, and its low cost is a further recommendation. Summed up, its chief points are accuracy, efficiency, and cheapness.

Details of the New Drencher.

The new gravity drencher consists of a brass cylinder of accurate capacity, with a suitable nozzle at one end, for inserting in the sheep's mouth, and, at the other end, an inlet tube for connecting the drencher

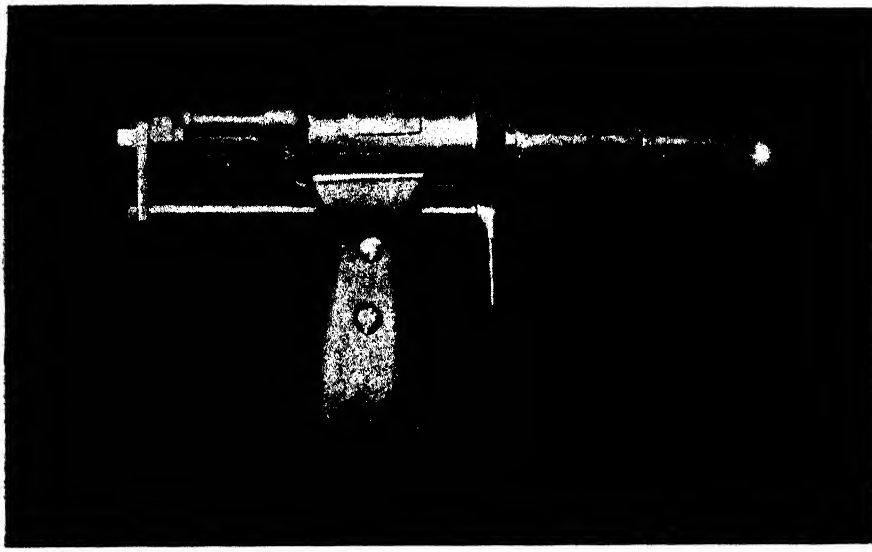

PLATE 14.
The "Ject-In" Sheep-drenching Gun—A new automatic apparatus of Queensland invention and manufacture.

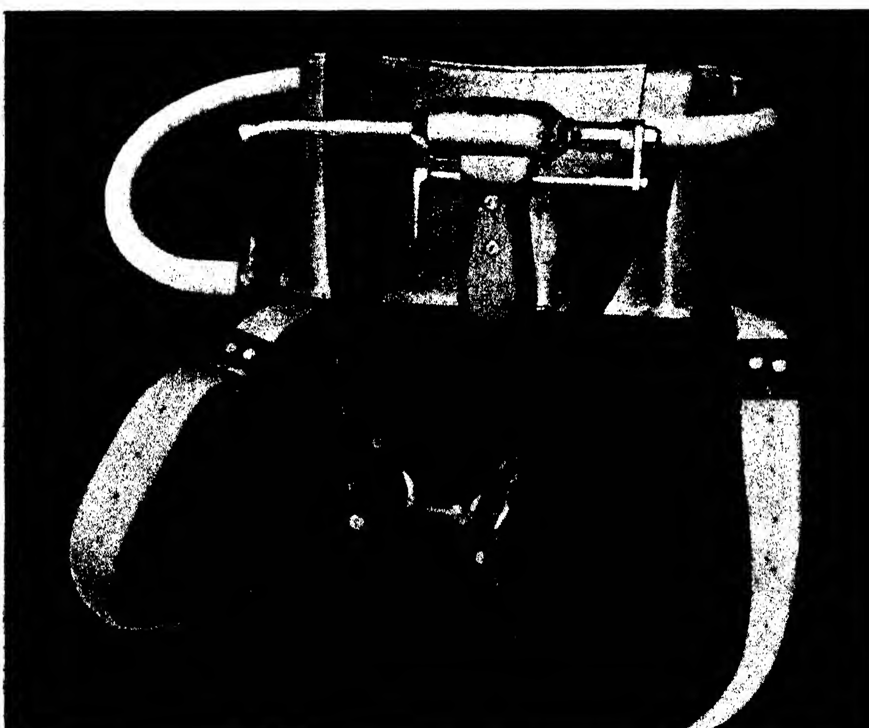

PLATE 15.
Knapsack container for the "Ject-In" Drencher for sheep.

to a suitable reservoir. Beside the inlet tube is a double acting air valve, which allows the air to be expelled from the cylinder when filling, and allows the air in, to deliver the dose.

The drencher has a pistol grip fitted on side of the cylinder, with a trigger attached to a rod moving parallel to the axis of the cylinder. This rod is connected in turn to the valve spindle, which with the valves works through the central axis of the cylinder. The valve spindle actuates both the inlet and outlet valves, which are so arranged that, normally, the inlet valve is opened and the outlet valve is closed and held in that position by a spring. On pressing the trigger against the spring the inlet valve is closed first and then the outlet valve opens to deliver the dose. The outlet valve cannot open before the inlet valve is closed, so it is impossible to get an overdose. On releasing the trigger the valves return to normal.

It should be noted that the gravity supply of the drench to the sheep refers only to the dose itself (1 or 2 oz.) and has no bearing on the supply in the reservoir as that is cut off immediately the inlet valve is closed, and only the dose itself runs into the sheep's mouth by gravity. In this way the drencher functions perfectly, with a full reservoir down to the last dose in it. All metal parts of the drencher are of brass, nickel-plated, and will withstand any chemical action due to the drench in use.

The drenching outfit generally supplied consists of two separate drenchers—1 and 2 oz. respectively for lambs and sheep, a 1-gallon reservoir (made of brass) with straps to hold it on the operator's back, and length of suitable hosing to connect the drenchers with the reservoir.

The drenchers are of simple construction, with no parts to get out of order, very strong, and guaranteed to stand a fair amount of rough usage—but not abuse. The new gun is very fast in action, in fact a 1-oz. drencher can be used on sheep, if necessary, by simply pressing the trigger twice. It can be easily cleaned by flushing with hot water. The drencher is so constructed as to withstand the corroding influences of bluestone and arsenic, and with ordinary use should last a lifetime with minor replacements.

In operation a knapsack is carried on the back and a handy length of hose piping conveys the drench to the gun. The grip is a good one, and just sufficiently strong to release the dose as slowly or quickly as desired. The mouthpiece is sufficiently bent to make the actual operation of drenching convenient.

The gun is constructed to administer a 1 and 2 oz. drench.

The gun has been tested carefully in the matter of correctness of dose. In use the apparatus proved handy and efficient, and may be regarded as a labour saver in no small degree. Moreover, its price is reasonable.

Banana Weevil Borer Control.

By J. A. WEDDELL, Assistant Entomologist.

THE present seems to be a suitable time at which to restate the position regarding the methods of control of the banana weevil borer. Permits for the planting of a large number of suckers have been issued, new districts are being opened up, and new growers are entering the industry. For his own sake, each grower must keep his plantation in a clean and healthy condition; if he does not do so, then steps will be taken to ensure the protection of neighbouring growers.

Essentially satisfactory control of the banana weevil borer depends on fore-knowledge leading to suitable preventive treatment, followed by consistent baiting throughout periods of apparent freedom from attack. There are a few main facts connected with the life-history and habits of the insect which have a direct bearing on control; once these are accepted the control recommendations are seen to be simple and obvious.

1. The eggs are laid into the banana plant tissue at or about ground level. They are inserted to a depth of about one-twelfth of an inch into a cavity eaten out by the female. Almost immediately afterwards sap exudations seal the egg in the cavity. The egg is thus safe from outside influences unless the outer tissue of the plant is removed.
2. It is the larval stage of the insect that causes the economic damage to the plants. The grub tunnels within the corm without breaking to the outside, and consequently it also is protected from direct control measures.
3. The insect pupates within the food tissue and this resting stage, during which transformation to the adult takes place, is also protected.
4. The adult feeds moderately, but the danger from it lies in the fairly continuous egg-laying during a long life. The beetles are quite active in dark places, and they shun the light; this suggests activity at night. If disturbed they sham death. The favourite sheltering spot in a plantation is in old rotting banana plants and the rotting butts. The adult is the only stage in which external feeding and wandering takes place, and routine treatment in the plantation can be directed only against the adult.

Plant Clean Suckers.

Every new area should start off with clean suckers, and the following points should be observed:—

1. The source of the suckers should be a beetle-free plantation, or one with only a light infestation in which control measures have been consistently carried out. It must be understood that this brief statement does not deal fully with the conditions under which suckers may be obtained, but gives only the broad outline. Growers should make themselves acquainted with the current planting policy as laid down by the Banana Industry Protection Board; particulars may be obtained from the local agent of the Board.

2. The suckers selected should, at the time of digging, be healthy and show no signs of banana weevil borer damage.
3. The whole of the corm of each sucker should be completely peeled to a thickness of about ⅛ inch. If in the course of this paring a larval tunnel is disclosed, the sucker should be rejected; in a few cases it may be possible to cut away a shallow infestation and leave only clean white tissue without destroying the sucker. The paring will thus ensure that larvæ are not present within the sucker, and at the same time will remove any eggs that may be lying unhatched in the surface tissue. This paring of the sucker and the consequential removal of the roots will not affect subsequent growth.
4. The suckers should be bagged and removed from the plantation before nightfall. Consequently, the suckers cut each day should be limited to the number that can be treated and carted away.
5. If desired the selected suckers may be sent unpared from the parent plantation, provided they are bagged and carted away before nightfall. On arrival at the new area they should be immediately pared as described above at some distance from the actual plantation; the parings and any rejected suckers should be immediately destroyed. Burning, or the spreading of the parings in the sun for quick drying, and chopping the rejected suckers into small pieces and spreading to dry are satisfactory methods, with the preference on the burning.

Bait the Plantation Regularly.

The standard poison for use against the banana weevil borer consists of one part of Paris green mixed dry with six parts by weight of flour. The most convenient quantities are 1 lb. Paris green and 6 lb. flour. These should be placed in alternate layers in a large tin with a tight-fitting lid and then well shaken together. It must be remembered that Paris green is a strong arsenical poison, and it should be stored and handled with care. The only apparatus needed for the application is a castor tin with fine holes. A ½-lb. cocoa tin with fine perforations in the lid makes a satisfactory poison carrier.

A careful watch should be kept in a young plantation, and any suckers which, by slowness of growth or death of the centre leaf, show signs of borer attack should be dug out, and if the suspicions are confirmed should be destroyed by slicing into small pieces for quick drying in the sun. The hole may then be replanted with a clean sucker.

As the plantation grows the stage will be reached when desuckering of unwanted eyes will be necessary. As each sucker eye is cut off or gouged out, the newly-cut tissue should be lightly but evenly dusted with the poison mixture. The butt of the sucker eye may also be cut off, dusted, and loosely replaced in position. The extra work involved in making of each cut surface a poison bait is simply that of carrying a small tin of the poison mixture. The implements for desuckering should always include a tin of 1 in 6 mixture.

The spent plants in mature plantations should be adequately dealt with after the bunch has been removed. The old plant should be cut off at not more than 6 inches from the ground, split up longitudinally, and cut across not less than four times. This ensures that the plant tissue will lie open, dry quickly in the sun, and be quickly rendered unsatisfactory as a breeding site and a shelter for the adult beetles. In the case of beetle-infested plants, it is required by regulation that the butt remaining be converted into a poisoned bait. The method is as follows:—

The plant is cut down, as above described, at not more than 6 inches from the ground, and the butt is again cut at or near ground level. This forms a separate slab a few inches thick, which should be dusted evenly on both surfaces. The upper surface of the butt should then be dusted and the dusted slab loosely replaced, preferably with a small stick or stone between.

Other methods of making poison baits of the old butts have been used, and these have given satisfaction. The two following descriptions may be of interest:—

Method 1.—The plant is cut off as close as possible to the ground and chopped up. With a suckering tool a deep cone is cut out of the centre of the butt. The surfaces of the butt, the cavity, and the cone are evenly dusted, and the cone is then loosely replaced.

Method 2.—This is the same as the preceding method, except that instead of a cone a deep wedge is chopped out of the butt with a cane knife or mattock. After dusting, a tiny stone in the cavity will ensure that the wedge does not fit too tightly when replaced.

Each of the above methods provides a poisoned cavity which will afford shelter to the beetles and remain moist, and therefore attractive for some time. A little trash over each bait will increase the period of attractiveness by delaying the drying out. The thickness of the dust application is rather important. What is required is a thin but even dusting or peppering of the tissue; undusted freshly-cut areas would provide attractive and safe feeding sites for the beetles, while thickly-coated areas would not be sufficiently attractive.

Two reasons for discouragement regarding baiting may influence some growers. The first is that complete eradication of the beetle may be expected by some, and a method which does not give it will be criticised. Complete eradication is an almost unattainable ideal; what can be accomplished is to reduce and keep the beetle population at a level where it will cause little or no economic loss. The second is that growers are often dissatisfied with the proved kill in the form of dead beetles in or near the baits. Remember that some hours will elapse after feeding before the insects die from Paris green poisoning, and in that time they may crawl to fresh shelter, and later they will be disposed of by ants and other scavenging insects.

The methods above described of making each fresh-cut surface into a poisoned bait, whether in suckering or after cutting the fruit, will ensure that at least two fairly fresh baits are present in each stool throughout the year—in other words, approximately 1,000 baits per acre. The cash outlay for materials is a few shillings, while the extra labour involved is negligible.

Queensland Grasses*.

By C. T. WHITE, Government Botanist.

THE known native grasses of the State, compiled from a list made by Mr. C. E. Hubbard, of the Royal Botanic Gardens, Kew, England, who spent about twelve months as a botanist on the staff of the Queensland Department of Agriculture and Stock, number about 450 different kinds or species. To these must no doubt be added another fifty yet to be scientifically catalogued and described, bringing our grass flora to a total of at least 500 species. Is it not natural to assume that among these we have some of outstanding merit and worthy of every attempt to distribute and improve?

Native Pastures.

Before dealing with any grasses specifically, it may be as well to give a brief general account of our native pastures. Excellent cattle pasturage exists along much of the coastal portion of the State. Typical tropical savannah forests, consisting of low eucalypts, wattles, and other trees, with an undergrowth of grasses and herbage, are found over much of the Cape York Peninsula, improving as one comes south to the Gulf country, where a great mixture of grasses and herbage occurs in the pastures, among the better grasses being Blue Grasses, Kangaroo Grasses, Flinders Grasses, Star Grasses, Couch Grasses, Love Grasses, Panic Grasses, and native Paspalums, Setarias, and Sorghums. Southward from Ingham, through Townsville to Proserpine, there is a "dry" belt. The native pastures are mostly coarse in appearance, and in a lot of the open forest country Blady Grasses and Spear Grasses predominate. During the wet season some of the larger grasses, such as the Tall Spear Grass (*Heteropogon triticeus*), the native Sorghums, &c., grow to a great height, eight to ten feet or even more. Some of the best pastures in the open eucalyptus country are composed of Kangaroo Grass in almost a pure stand.

Of recent years anywhere near a settlement *Chloris barbata*, an ally of the Rhodes Grass, and noticeable on account of its purple heads, has become an outstanding grass in the native pastures. It has been highly spoken of, but it is rather doubtful if it has any great value. The common tropical weed, *Stylosanthes mucronata*, the so-called Townsville Lucerne, has spread everywhere, greatly improving the pastures. Cattle are very fond of this leguminous plant, and analysis shows its feeding value to be high. Unfortunately, it is only of annual duration, and dies out on the approach of the dry winter and spring months. Some native legumes enter into the composition of the pasture, notably species of *Alysicarpus*, of which the most important is *Alysicarpus vaginalis*. These are worth every encouragement, and where allowed to seed and reproduce naturally for a season or two, treble or more the carrying capacity of the land. From Proserpine southwards to Koumala the rainfall is high, but the pastures are poor. This is essentially sugar country, however, and stock-raising is of little importance.

Southward to about Gladstone is another "dry" belt. The pastures improve considerably, carrying in many cases a very heavy mixture of species, though they suffer severely from continued dry spells, parti-

* Paper read before the Royal Society of Queensland, 23rd October, 1933.

cularly in the winter and spring months. Among the grasses composing the pasture are different sorts of Blue Grasses, Kangaroo Grasses, Star Grasses, Couch Grass, Love Grasses, Native Millets, Cockatoo Grass, and others.

In some parts of Central Queensland, such as the Dawson Valley, native pastures are those of the coastal type, except that some of the better western grasses, such as the Mitchell Grasses, Flinders Grasses, and some of the better Panic Grasses, intrude.

In the Burnett, Lockyer, and Brisbane Valley areas, the better open eucalyptus country supports native pastures for the most part of a rather high order, consisting of a general mixture of Blue Grasses, Panic Grasses, Kangaroo Grasses, &c. Herbaceous plants, comprising a fair number of legumes, are also a feature of these pastures. Unfortunately, a wide area of this country has suffered badly through overstocking, with the consequence that the better mixtures have been eaten out, leaving, in many cases, almost a pure stand of the Bitter or Pitted Blue Grass (*Amphilophis decipiens*).

An interesting feature has been the alteration in some localities, particularly near the larger towns of the South, of the composition of the native pasture. In most cases this has deteriorated through overstocking, but in many cases the original mixture has given way to pastures almost entirely composed of the Blue Couch (*Digitaria didactyla*), and here and there in smaller areas the common Couch (*Cynodon dactylon*), and this must, I think, be regarded, on the whole, as improving the carrying capacity of the pastures.

A distinct type of pasture in coastal Queensland is the fresh-water swamp pasture of a high grazing value. In this the most important grasses are the Water Couch (*Paspalum distichum*), White Water Couch (*Panicum obseptum*), Rice Grass (*Leersia hexandra*), Native Millet (*Echinochloa crus-galli*), and *Hemarthria compressa*. Along the whole of the coastal belt a distinct type of pasture is the salt-water meadow, which in most cases consists of a pure stand of the Salt Water Couch (*Sporobolus virginicus* var. *minor*). In the more muddy places towards the edge of this pasture the Salt Water Couch may give way to the Salt Water Paspalum (*Paspalum vaginatum*).

Pastures of Western Queensland.

The pastures of Western Queensland are of a sufficiently high standard to be famous throughout Australia. Of the grasses composing the pastures, the best known are the Mitchell Grasses, Flinders Grasses, native Panic Grasses, Blue Grasses, better-class Star Grasses, and Love Grasses, &c. Here and there on the Darling Downs and in the Granite Belt Danthonia Grasses, such as *Danthonia pallida, Danthonia racemosa,* and *Danthonia longifolia,* are of some importance, though not nearly to the same extent as they are in the colder places further to the south, such as the New England Tableland. Annual herbs following the summer rains are a feature of much of the grass land. These belong to a great range of families, the Amaranths, the Saltbushes, the Legumes, and the Mallows being among the most valuable.

Mitchell Grasses.

Now to deal with some of the grasses individually. Undoubtedly the grasses most associated with Australia, both in the country itself Though Mitchell is generally regarded as the discoverer of Mitchell who found *Astrebla pectinata* near Condobolin and on the plains of the Bogan in New South Wales in 1836. These were described at the time by the great English botanist Lindley as *Danthonia pectinata*, and are to be found preserved at the present time at the Museum and Herbarium of the Department of Botany of the University of Cambridge, England. Though Mitchell is generally regarded as the discoverer of Mitchell Grass, specimens had already been collected by both Cunningham and Fraser as early as 1817, though apparently they remained undescribed, and indeed unrecorded at all, until C. E. Hubbard, when monographing the genus, found the specimens at the British Museum of Natural History, London. The Mitchell Grasses are widely spread over the heavy blacksoil plains of Northern Australia, Central Australia, Queensland, and New South Wales, but finding their greatest development in Queensland. The genus is confined to Australia. Four distinct species are to be recognised:—

1. *Astrebla pectinata*, often known as the Common Mitchell, is the commonest form in New South Wales, but is comparatively rare in Queensland. It has a wide distribution through Central Australia to Western Australia, but in the last-mentioned State is, I understand, very rare.

2. *Astrebla lappacea*, known as the Wheat-eared or Curly Mitchell. This is the form most abundant in Queensland. Like the Common Mitchell, it has a wide distribution, but is nowhere so abundant as in Central Queensland. It has a long wheat-eared seed head, and is probably the most important species of the genus from an economic standpoint. In the older literature it is referred to as *Astrebla triticoides*, but this excellent specific name has, unfortunately, to give way on account of priority to *Astrebla lappacea*. This latter name was used by Lindley as far back as 1848, when he named the grass *Danthonia lappacea*, based on specimens collected by Sir Thomas Mitchell, near Mitchell, Queensland, in 1846.

3. *Astrebla squarrosa* is the Bull Mitchell, moderately common in parts of Central and North Queensland, also found in the Northern Territory and the north-west of New South Wales. It is a coarse species not occurring in such great quantities as *Astrebla lappacea*. Its economic value is not quite clear at the present time, though it does not seem to be the equal of the common *Astrebla lappacea* as a stock grass. It yields a very large seed, however, and a correspondingly large grain, and if Mitchell Grass has any importance in the future as a grain crop *Astrebla squarrosa* may prove of considerable importance.

4. *Astrebla elymoides*.—This is variously known as the Hoop Mitchell, Wire Mitchell, and Weeping Mitchell. It is very distinctive looking from all the others, and has a wide distribution through the north-west of Western Australia, Northern and Central Queensland to New South Wales. It is quite a good fodder grass, but suffers in comparison with its better relatives.

Flinders Grasses.

Ranking next in importance to the Mitchell Grasses in the eyes of the pastoralists of Northern and Western Queensland are the Flinders

Grasses, of which at least four distinct kinds have now been recognised. They all belong to the genus Iseilema, which is composed, so far as known, of nine species, five of which are found in tropical Asia and four in Australia. Until recent years all the Australian kinds were looked upon as forms of one species. During the summer months of 1909-1910 the Czecho-Slovakian botanist, Dr. Karel Domin, botanised extensively in Queensland, and he paid special attention to the grasses, making extensive collections. He recognised four distinct species among the grasses known collectively as Flinders Grass. Of these I think the most abundant, and fortunately the best of the genus, is *Iseilema actinostachys*. The value of Flinders Grasses lies in their peculiar habit of growing very quickly during the rainy season, soon dying off, but being extremely palatable and nutritious in the form of standing hay, in this respect surely differing from all other known grasses. The nutritive value is due to the amount of grain produced and the peculiar way in which it is borne among small leaves over almost the whole plant. The Flinders Grasses are extremely brittle when dry, but all stock greedily lick up the broken pieces and do well on them. As a hay crop for dry tropical and subtropical regions with a short summer rainfall season, the Flinders Grasses are probably unequalled, making up in high nutritive value what they lack in bulk.

Blue Grass.

Extremely important on the Downs country of Queensland and New South Wales, and particularly in this State, is the Blue Grass, *Dichanthium sericeum*, in its typical form distinguishable in the field by its bluish-green colour, luxuriant appearance, and soft silky seed heads. A number of forms are distinguishable, and they are at present under review by Mr. C. E. Hubbard, whose classification of them is looked forward to by botanists and agrostologists. One may say, "Why worry about the finer points of the classification of these grasses at all? Where does it lead?" But surely it is hardly necessary to point out that a good sound botanical classification is the basis on which all future work on the improvement of the grasses by selection and hybridisation rests. Blue Grass has an exceptionally high reputation as a fodder among pastoralists. It is usually one of the earliest grasses to shoot in response to spring and early summer rains, but is not particularly drought resistant. It makes one of the best grass hays possible, and as it produces an abundance of seed it is worthy of study from the agrostologist and plant breeder. E. Breakwell, in his excellent book on "The Grasses and Fodder Plants of New South Wales," states that it has been found that the smallest and plumpest spikes produce the best seed.

Panic Grasses.

Forming a very large percentage of the bulk of the average native mixed pasture are the various sorts of Panic Grasses. These were all included in the earlier works on Australian grasses under the genus Panicum. This genus has now, however, been divided into numerous smaller genera, the genus Panicum itself, in a restricted sense, being comparatively small, and including, for the most part, grasses with widespreading, much branched, seed heads, such as *Panicum decompositum*, often referred to as Native Millet, *Panicum trachyrachis*, Coolibah Grass, *Panicum prolutum*, Coolah Grass, and a number of

others, common enough in the pasture but lacking distinctive local names. As at present understood, twenty different kinds of Panicums, or Panic Grasses proper, are found in Queensland.

Paspalidium Grasses.

Of the grasses split from the Panicums are those forming a group now known as the Paspalidium Grasses. Paspalidium is a small genus of about sixteen species, of which ten are found in Australia, all the Australian species being found in Queensland, though most, of course, extend to New South Wales and the Northern Territory. They are remarkable for the great amount of grain they carry in narrow, spike-like seed heads. Most of them are extremely palatable. The largest is *Paspalidium globoideum,* known as Shot Grass or Sago Grass in Queensland. It grows 3 feet to 4 feet high or more, is extremely palatable to stock, and bears a sago- or tapioca-like grain. This grain is borne in great abundance, and is one of the staple foods of the grain-eating birds in the west; in fact, one pastoralist, Mr. J. Garvey, of Fernlees, Central Queensland, in sending specimens of this grass along with other Paspalidiums, stated that the Budgeeragahs fed so heavily on the seed that the grass did not get a chance to establish itself properly. Among the smaller growing Paspalidiums are several known as Brigalow Grasses or Wallaby Grasses. Prominence has recently been given to one of these in a paper before the Royal Society of Queensland by Dr. E. Hirschfeld, and following this a good deal of interest has been focused on this particular grass. Since the reading of Dr. Hirschfeld's paper I have had several specimens from different pastoralists, along with some valuable notes. Particularly am I indebted to Mr. J. Garvey, of Sandhurst Park, Fernlees. A series of specimens from him with notes attached is exhibited herewith.

Paspalidium flavidium is a large species intermediate between the smaller Brigalow Grasses and the Shot Grass or Sago Grass, *Paspalidium globoideum.* Of the Brigalow Grasses proper we can now, I think, recognise at least three distinct species, namely: *Paspalidium gracile, Paspalidium distans,* and *Paspalidium caespitosum.* At the present stage of our knowledge I do not care to state which is the best. Probably the values are more or less similar; but, in any case, they represent a very fertile field for intensive work by agrostologists in the future.

Many other grasses go to make up the mixed native pasture—Love Grasses, Kangaroo Grasses, Oat Grasses, Star Grasses, &c.—but time does not allow to deal with these in any detail. However, farmers, pastoralists, and others are invited once more to forward specimens of grasses and herbage to the Department for identification and report.

Agricultural Notes.

By H. S. HUNTER, Agricultural Branch.

Seasonal Prospects.

THE year 1934 has been ushered in in the midst of a bounteous season as a result of well-distributed and profitable rainfall, which, commencing in the winter months, continued at regular intervals of short duration throughout the spring and early summer.

Although some districts may have experienced a lack of moisture at some time during the spring months, and others a surfeit of wet weather, the season generally is regarded as the best within the memory of persons who gain their livelihood from the products of the soil.

A pleasing feature of the improved conditions is that good soaking rainfall has extended to the inland pastoral areas, some parts of which have been in the grip of drought for a number of years. In the Central-West, there is an encouraging revival in pastoral activity, following on the resuscitation of pastures, the replenishing of water supplies, and the rise in wool values.

In the agricultural areas, the principal industries largely have been in a state of over-production, with, as a consequence, low market values for market products; but, nevertheless, a land hunger is in evidence, as witness 1,143 applications for three blocks of land opened for selection recently in the Chinchilla district.

Sugar.

Along the tropical coast a bumper sugar crop is expected owing to phenomenal winter rains, and it is anticipated the total yield will break all previous records. Many mills will exceed their peak as allotted under the "peak year scheme." The heavy production this year has brought up the question of restricting individual acreages, and the matter will be considered at a conference to be held within the course of a few weeks. The advance payment for sugar produced in excess of the peak is being made on the basis of £5 12s. per ton.

Wheat.

Most of the wheat crops have been affected to some degree by continuous wet weather immediately prior to and during harvesting, which resulted in the lodging of the crops and the bleaching of the grain. In some districts, where harvesting operations were not unduly delayed, little damage was sustained by standing crops, but where bagged wheat was caught lying in the field, the grain suffered.

Unfortunately, earlier expectations of a record yield of high-quality grain will not now be realised, but, nevertheless some satisfactory returns have been obtained. For example, numerous crops of from 30 to 45 bushels per acre have been reported. Pittsworth probably will be hard to beat for the district average. On Mr. J. E. Bligh's "Anchorfield" property, at Brookstead, a 10-acre seed propagation plot, planted in co-operation with the Department of Agriculture, with the new "Seafoam" variety recently released from Roma State Farm, gave an average return of 49·8 bushels per acre. At Felton, the encouraging

return of 512 bags from 32 acres, or 48 bushels per acre, was obtained with the Pusa variety by Mr. M. Cooper. An adjoining paddock of Clarendon, carried an equally heavy crop, but owing to heavy infestation with convolvulus, it was possible to recover only an average yield of 36 bushels. Mr. F. Benn, of Apunyal, secured an average yield of 45½ bushels of good quality wheat from a 6-acre area.

The Maranoa has experienced the best wheat season for many years and, although rains came at an inopportune time, the harvesting was not interfered with to the same extent as on the Darling Downs. A yield of fairly good quality grain is expected, which in quantity will overtax the existing storage facilities. One encouraging feature of the late rains in that district is that the soil is well stored with moisture, some of which, by immediate ploughing and thereafter periodical cultivation, can be retained until next planting season—a factor of importance to the wheat industry of the Maranoa.

Cotton.

An exceptionally heavy rainfall over the main cotton belt has made it difficult for cotton-growers to get on to their land and to keep weed growth in check, but, nevertheless, the season has been unusually favourable to the growing crops. It is estimated that approximately 85,000 acres have been planted, and experiences to date indicate a record harvest.

Peanuts.

A record crop also is in prospect with peanuts. Some 8,000 acres have been planted, and the Peanut Board is experiencing difficulty in meeting all orders for seed. The increase in area is due largely to the fact that for the first time in the history of the pool there is no carry-over from the previous season, and farmers had been enjoined to plant larger areas to meet Australia's peanut requirements. It is to be regretted that the Commonwealth Government since has lifted the embargo on the importation of Chinese peanuts, and as a consequence the crop will have to be marketed without that assistance.

Tobacco.

The usual difficulty is being experienced in raising seedlings owing to the ravages of disease, principally blue mould, and in many instances new seed-beds are being sown.

Considerable success has attended the use of sprays recommended by the Department, but in many instances the spray has been washed off the plants by the frequent rains. The period for transplanting to the field now is near at hand, and until this operation takes place, it will be difficult to forecast the area which will be planted with the crop this season. In the Texas and Inglewood districts where transplanting takes place earlier than nearer to the coast, it is apparent the area will be considerably below that of last year. In other parts reduced areas are possible, owing to numerous causes, including lack of finance, disease, and unsuitable soil. Early forecasts indicate increased areas in the neighbourhood of Mackay and Miriam Vale.

Large quantities of unsold leaf of the darker grades are proving embarrassing to the growers, especially where the proceeds from the last crop have not been sufficient to meet commitments.

Maize and Dairy Fodders.

The mid-season and late-planted maize crops are in excellent condition and, given a continuance of the favourable season, exceptionally good yields should result. Heavy yields of dairy fodders are assured; in many instances these are being harvested and converted into hay or silage.

The latter method is proving popular, as weather conditions have not favoured haymaking. For this reason lucerne is being ensiled to some extent. Although not suitable for this purpose when used alone, it makes excellent silage when mixed with maize or some other bulky fodder.

Fruit Crops.

The continuous rains have threatened the success of the early fruits from the Granite Belt by adversely affecting their flavour, but later fruits are doing well. Citrus and tropical fruits have excellent prospects of producing heavy yields. The citrus crop, which may be a record for the State, is expected to mature earlier than usual, and thus will be enabled to reach the local and Southern markets before the Southern-grown citrus fruits are available. The grant from the Fruit Industry Sugar Concession Committee to assist the pineapple-canning industry has been renewed for another year.

PLATE 16.—LIVE PORK FOR CHRISTMAS AT A NEW GUINEA HEAD HUNTERS' CAMP.

These Mohamato natives had previously been shooting arrows at passing survey men, so brought in a pig as a peace offering. They always roast their pigs alive, and the jungle is made hideous with the dying animal's cries.

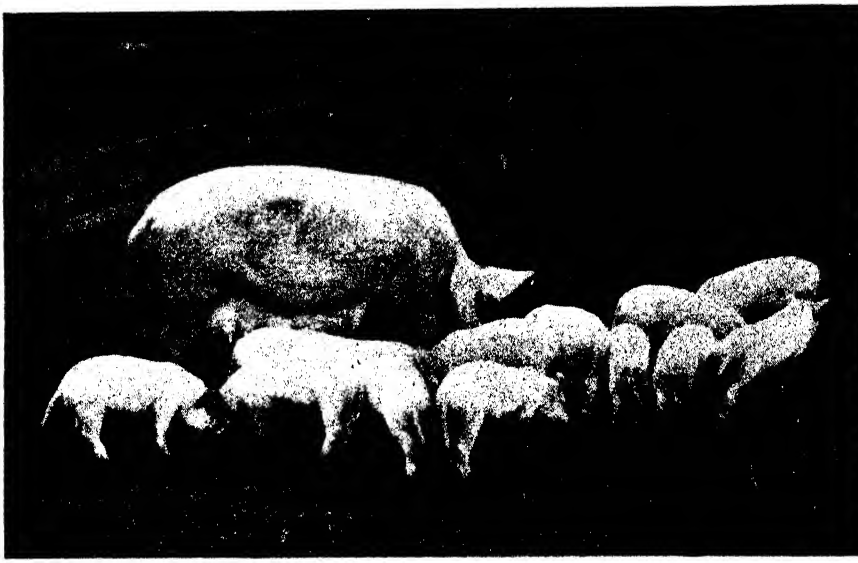

PLATE 17.
Gatton Queen and her litter in the Large White section of the Piggery, Queensland Agricultural College, Gatton.

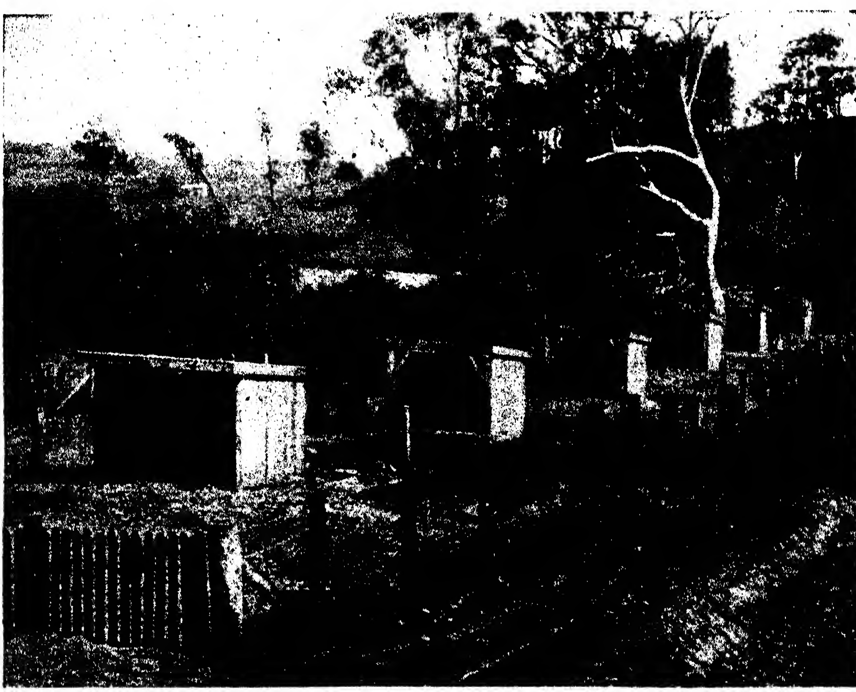

PLATE 18.
Piggeries at the Willowburn Hospital, Toowoomba, showing layout of yards.

PLATE 19.
A shady corner of the Pig Run at Willowburn Hospital, Toowoomba.

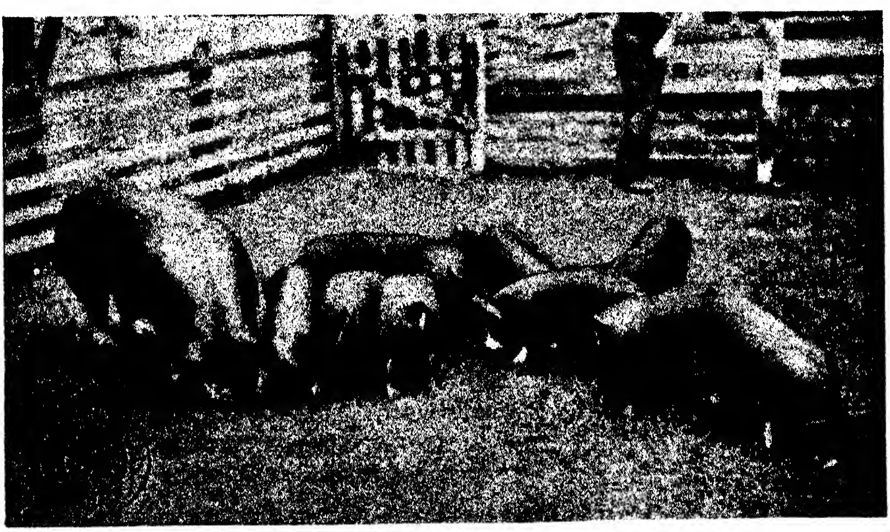

PLATE 20.
Gatton Dell and her litter in the Berkshire section of the Piggery, Queensland Agricultural College, Gatton.

The Premier's New Year Message.

PROGRESS TOWARDS PROSPERITY

THE year 1934 is being ushered in under more happy auspices than have obtained since the economic disturbance first began to manifest itself. Most parts of the State have shared recently in Nature's bounteous rains, which not only give encouragement to our citizens generally, but ensure the maintenance of the volume of production in our primary industries.

The rise in our wool prices, particularly, will mean a welcome increment in the national income of the State, the effect of which may be gauged from a comparison of the value of our exports overseas for the first five months of the current financial year up to the end of November last with the corresponding period of the previous year. The published statistics show that for the months of July-November of the current year, exports overseas from the State were valued at £2,400,000 more than for the same months of 1932-33.

A pleasing feature of recently published figures is the fact that the volume of employment continues to show progressive increases, and during the coming year it will be the Government's aim to implement this improvement in every possible way. The programme of works and development that will be undertaken in 1934 will not only provide further avenues of normal employment, but will be of much value in assisting commercial activity generally.

I earnestly hope that the coming year will bring with it an improved price level that will offer stability to all our citizens engaged in various kinds of industry. Events of recent years since the economic crisis asserted itself indicate the necessity for vital adjustments in order that undeserved poverty and the evils of unemployment might be banished from civilisation.

It can be accepted as an axiom that man's inventive genius and the application of scientific methods have been successfully applied in the realm of producing commodities that are essential for the welfare of the human race. The same energy, zeal, and activity are required in the solution of the concomitant problems of distribution and consumption.

I wish our citizens a Happy New Year, and sincerely trust that the State generally will continue its progress towards restored prosperity.

W. Forgan Smith

THE DAIRY INDUSTRY.

SUPPLIED BY THE DAIRY BRANCH.

NOTES ON STARTERS (LACTIC CULTURE).

Flavour and Aroma.

Scientific research has revealed that during the normal ripening period the development of flavour and aroma in starters is not proportional to the acid production, but a definite acidity such as 0.65 per cent. to 0.75 per cent. is necessary before the desired flavour and aroma become pronounced.

With continual growth of the organisms over-ripening results, giving off flavours and aromas that are sometimes very objectionable. Considerable acid development is necessary in a starter, but overacidity is undesirable. The exact range of acidity over which flavours and aromas are satisfactory probably varies with different cultures.

Acidity.

The composition of milk has an important influence on the acidity development in starters. It has been shown that there is a general tendency for a higher acidity to be developed by a starter in milk with a high total solids than in milk with a low total solids.

The amount of acidity developed by a starter is apparently a more or less definite thing and cannot be changed appreciably by varying the amount of inoculating material used in the production.

Over-ripening of Starters.

The term over ripe in connection with starters refers to the holding of a firmly coagulated starter under conditions favourable for the growth of the contained organisms. The result of such continued holding is the development of an excessive acidity, and a more or less objectionable flavour and aroma. Excessive acidity is due to the failure of the acid, which caused the coagulation, to restrain the growth of the acid producting organisms, while over ripe flavour and aroma are presumably due to the products formed by the bacteria either directly or through the action of such materials as acids and enzymes elaborated by them.

Effect of Temperature of Pasteurisation of the Starter Milk on the Rate of Coagulation of a Starter.

Results have shown that milk heated to 145 deg. Fahr. for thirty minutes developed acid, and coagulated more slowly than milk heated to a considerably higher temperature.

Essentially the same rate of growth of starter organisms occurred after heating to 160 deg. Fahr. for thirty minutes, as when a higher temperature was used for this period. Heating to a temperature of 180 deg. Fahr. for at least thirty minutes is the practice that is usually desired in the production of a high grade starter. Somewhat lower temperatures might be used without any noticeable change in results, but a much lower temperature should be avoided. This temperature brings about a fairly rapid coagulation of the starter, and investigators have found that rapidly coagulated starters were better than those which coagulated slowly. This advantage may be due to the greater tendency of rapid acid development to restrain undesirable organisms.

Quantity of Starter for Inoculation Purposes.

The rate of coagulation of the starter is not greatly affected by the amount of starter added for inoculation purposes; that is, a light inoculation of the milk for the production of a starter sometimes coagulates quicker than a heavy inoculation, while at other times the reverse occurs.

MILK FOR CHEESE MAKING.

For cheese making, the milk supply should be graded, and the grading checked by the use of the methylene blue test and the Wisconsin curd test in conjunction. In this way, exact information as to the quality of the milk of each supplier at every delivery is obtained. It also stimulates the interest of suppliers in the manufacturing processes.

Suppliers should always be informed of the results of factory tests, for improvement in the quality of milk is primarily an educational matter. The sources, development, and control of bacteria in milk should be discussed with them. While daily deliveries of high grade milk are usual, it must be remembered that from time to time milk of a lower quality is delivered from the same farms. The bacterial count in the poorer milk is often so high as to effect seriously the whole of the day's supplies

to the factory with which it is mixed. The fact that most of the milk delivered is high grade shows that there is no reason why every gallon sent in should not be of the same quality.

It is obviously quite unfair to penalise one's more efficient neighbour by supplying milk of a lower quality, which on being mixed with the whole supply must bring the general average of quality down. In the language of the bush it is nothing more or less than "polling on your mate," a social sin which even the best of us finds it hard to tolerate.

What one farmer can do in the same locality and under the same conditions, the other farmer can do, so there should be no excuse really for sending second rate milk to the cheese factory. If, however, in spite of whatever care is taken to keep supplies up to the required standard, no improvement is apparent, the suppliers concerned should be encouraged to discuss their individual problems and methods of milk production and handling, and so help to clear up any difficulties or doubts they may have. If any improvement in the supply results from investigation or advice, the farmer concerned ought to be told about it straightaway. If on the other hand, low quality persists in a particular supply, the producer should be made aware of the facts, in a frank and friendly way, so that they may be grasped readily and appreciated.

Mere fault finding is useless as well as exasperating. If an investigation is necessary, let it be a friendly investigation. The work, after all, is educational; it becomes a check on supplies and factory processes through which the faults, whether on the farm or in the factory, may be corrected.

To maintain an efficient check on the quality of supplies, all milk should be sampled immediately on delivery each day. To sample milk one day and neglect it the next is anything but satisfactory, for variable conditions make it impossible to interpret the results correctly. Climatic changes, for instance, influence directly bacterial counts.

When all is said and done, the thing that matters most is the financial return. Show the supplier that a high grade product puts more money into his pocket, and he will work overtime in finding and remedying the faults that reduce his income.

MINERAL DEFICIENCY IN DAIRY STOCK.

MEDICAL men, research workers, and other interested people have during the past ten to twenty years realised that many abnormal and diseased conditions are connected with or due to deficiencies in the food supplied to stock, and that some of these diseases may be traced to the absence of the proper quantity of mineral substances in the soils in which the grass and crops are grown.

Considerable research on the subject by Sir Arnold Theiler, South Africa, Orr, of the Royal Institute at Reading, England, Eccles in America, and Henry and Brunnich in Australia, has demonstrated definitely that soil and pasture are the keys to normal health in stock.

Mineral deficiency in soil and pastures is of particular interest to stockowners in this State, for upwards of 70 per cent. of the products of the State are derived from our native pastures.

One of the most demonstrable deficiency diseases in humans is to be found in the case of those associated with iodine deficiency. This is often reflected in the enlargement of the thyroid glands producing what is known as goitre. The thyroid glands are situated on either side of the windpipe and these store and distribute the supply of iodine to the body. This deficiency in iodine supply not only produces goitre but affects also the functioning of other glands, resulting in abnormalities in growth both physical and mental. In countries such as Switzerland, where the drinking water supply is obtained from melted snow, the result of iodine deficiency is most marked. In Switzerland, for instance, there are said to be over 50,000 imbecile dwarfs. It has been found, however, that where iodised salt is fed, the condition can be prevented and normal development in body and mind continued. In such countries it is usual also to sell iodised sweets, as lollies provide a good medium through which to supply the iodine to children.

Stock are affected very considerably through such a deficiency, which is, of course, more marked in certain parts of the world. In British Columbia (America), for instance, where there is a marked deficiency in iodine, investigations revealed that it was the cause of heavy mortality in calves and pigs through abnormal births.

Recent investigations, however, indicate that it is doubtful whether there is any marked iodine deficiency in Australia. But iodine deficiency is only one direction from which trouble may arise. In different portions of the State we

find cows often passing away an idle hour chewing bones or rags, licking clay deposits, or even finding solace in a stone. This is an instinctive endeavour on the part of the cow to supply herself with some mineral that is deficient in her food, and phosphorus and calcium are the two most common elements that are lacking.

Lime is an important factor in controlling the clotting of the blood, regulating the heart's action, determining the firmness of muscle, assisting the digestion of fat, and in controlling the action of other minerals on the body. Phosphorus is essential for the building up of all tissues of the body, and without it the supply of milk and flesh would be impossible. These two minerals enter very largely into the composition of bones, and, consequently, young animals developing their skeletons or cows in calf require comparatively greater amounts of these minerals.

Mineral Content of Milk.

It must also be remembered, apart from body requirements, there are seven pounds of mineral matter in 1,000 lb. of milk, and as a heavy producing animal yields her own weight in milk each month, it is essential that she be supplied with an adequate mineral ration to remain in normal health and maintain production to her capacity.

Mineral-Deficient Soils.

The area of mineral-deficient lands within the State is not definitely known, but it is known that the greater part of the coastal area falls within this category. Comprised in this area, however, are portions of normal mineral content, such as where basaltic outcrops occur, and on the alluvial soils of river flats.

It is in these deficient areas where osteophagia (bone chewing) and osteo malacia (bone disease) occur. This abnormal condition in cattle has been noticed in inland country. In the Charters Towers area, investigations are at present being carried out by the Council for Scientific and Industrial Research in regard to a deficiency disease referred to locally as "pegleg."

In South Africa, where phosphorus deficiency is a general characteristic of the soils, investigatory work was carried out some years ago into diseases known by the Dutch names of "Stijfziekte" (Stiff sickness) and "Lamziekte" (Lame-sickness), which were the cause of heavy losses in stock through abnormal growth and mortality. It was at that time determined that these diseases were the indirect consequence of phosphorus deficiency.

It is impossible for any animal on a diet poor in essential minerals to make normal growth or be capable of normal production. The deficiency is thus the cause of ill health, which may vary in degree from a hardly noticeable lack of the bloom which is characteristic of an animal in proper health to a state like rickets, where it can be obviously diagnosed a disease. Generally it is evidenced in unthriftiness, bone abnormalities, lameness, broken bones, depraved appetite, decreased milk yields and breeding difficulties.

Unfortunately, it is only when the trouble is more or less in an acute form that it is noticeable to the untrained eye, with the result that there are thousands of cattle suffering from malnutrition due to mineral deficiency quite unknown to their owners. The direct economic loss to dairy farmers so situated must be enormous.

If mineral deficiency is suspected on a farm—and this will apply to most of our coastal farms—measures should be taken immediately to remedy it. Obviously the natural method is to ensure that the pastures are not deficient, but as this entails top-dressing the method is too costly to be essentially practicable. It is preferable to supplement the food supply by substances containing the necessary minerals.

A Mineral Mixture for Stock.

In this State it is recommended that a mixture of two parts of finely ground sterilised bonemeal, one part of common salt, and a small amount of potassium iodide, 1 or 2 oz. to 1 cwt. of lick mixture, be supplied to dairy cattle. This mixture supplies lime, phosphorus, and iodine, while the salt has a beneficial action on the digestive system. Nauru or Ocean Island phosphate may be substituted for sterilised bonemeal if the latter is not procurable. This lick mixture may be fed at the rate of 2 oz. to 4 oz. per day, but it is preferable to place the lick in a suitable position and allow the animals to partake of it as required. Hand-fed cows in profit can be allowed 2 oz. per day in 1 lb. bran during milking in the shed. The ration could be placed in a small box at the head of the bail to be licked up by the cow.

Much research work remains to be done in respect to deficiency diseases; in fact, it may be said that only the fringe of the subject has been touched. The coming years will undoubtedly see great progress made in this work, both in the veterinary and medical fields.

THE QUEENSLAND PIG INDUSTRY ACT OF 1933.

THIS Act aims at effecting immediate and very definite improvement in the systems under which pigs are bred, fed, managed, and marketed. It aims primarily at the production of healthy, well developed stock for the local, interstate, and overseas trade, under conditions conducive to greater efficiency and enhanced returns to the producer.

Incidence of Disease.

The pig population of Queensland is approximately 250,000 or one-fifth of the total number in the Commonwealth. A very conservative estimate of present mortality in young pigs—i.e., pigs under 6 months of age—would state the figure at 25 per cent., or a loss each year due to specific and nutritional diseases of some 62,500 young pigs, which might readily be stated as carrying a nominal value of £1 per head. Condemnation of pig carcasses on slaughter for tuberculosis and other preventable diseases total approximately 1.14 per cent. Thus, 4,500 pigs are condemned annually which would carry a market value of 50s. per head, or a total sale value of £10,000. Condemnation of pig heads affected with tuberculosis, abscesses, &c., total 4.38 per cent., while the losses from bruising and damage, improper castration, and from other causes are very heavy.

Industry Losses.

In round figures, therefore, it might be said that the losses from preventable diseases in the pig industry total very close to £100,000 per annum—a condition of affairs which calls for very urgent and definite action on the part of the Government, hence the legislation aiming at reduction in the incidence of disease, and greater efficiency in the industry.

General Improvement in Sanitation and Hygiene.

The Act provides for a general improvement in the conditions under which pigs must be kept on farms. It prescribes in sections 5, 6, 7, 8, and 9 that piggeries shall be kept in a clean and wholesome condition and subject to the control of departmental inspectors. As is well known, there is a tendency on many farms to treat the pigs as scavengers and to permit them to be kept under insanitary conditions—conditions favourable to the development of disease.

It is the desire of those responsible for framing the Act to very definitely assist producers who are sufficiently well informed to understand and practice sanitation, and to keep their pigs under healthy conditions. Similarly, it is intended to extend the instructional campaign so that there will be no necessity to penalise farmers, except in cases of refusal to observe the ordinary rules of health and to co-operate with the Department in a clean up campaign.

Section 5, in addition to providing for immediate improvement in the conditions under which pigs are kept and fed, definitely provides the inspector with much needed powers to have improvements effected, a power which, in the past, in the absence of disease, inspectors have not possessed.

Provision for notification of disease is essential, especially in cases of infectious and contagious diseases which, in themselves, are responsible each year for a great deal of loss. It is not claimed that Acts like the Diseases in Stock Acts are defective, but rather that with the extension of pig-raising activities it becomes essential to concentrate and to have included under one Act the numerous clauses referring to pigs that are now scattered through several Acts.

Marketing—Sales, Grading, &c.

The basis of the clauses in marketing sections, 10, 11, 12, 13, 14, 15, have been subjects of discussion at numerous meetings of committees of the Queensland Pig Industry Council, and have also been under notice of the Queensland Meat Industry Board and of pork exporters and embody the general desire of trade interests. To encourage the farmer to improve his stock and his piggeries he needs to be paid more on a quality than on a weight basis for the pigs he markets, hence the inclusion of a section to provide for grading of pigs and of carcasses by officers who have the certificate of efficiency conferred on those who qualify by examination as pork and bacon graders.

Section 10 requires that, where pigs are purchased over the scale by a representative of any factory, such representative shall place on such pigs a sufficient mark to ensure identification of the vendor in order that it will be possible more readily to trace disease to the source of origin. Some difficulty arises by reason of the different conditions under which pigs are purchased by proprietary and co-operative factories, but it is believed that the clauses 11 and 12 will give ample scope for the protection of farmers and of business firms, for the farmer is not the only one that suffers as a result of disease and mortality in his herd, or heavy losses for condemnations.

Provision has, however, been made for the net proceeds from the sale of any by-products obtained from a pig, the whole or part of the carcass of which has been condemned, to be paid to the vendor.

Provision has been made for examination of the quality of carcass pork, or bacon sides or parts thereof, and if necessary for a stamp indicating the quality on such goods. This is a clause designed entirely in the interests of producers and consumers.

Regulations.

Regulations under this Act are now being drawn up and it is expected that the Act will be in operation early this year.

QUEENSLAND SHOW DATES, 1934.

Stanthorpe: 7th and 9th February.
Killarney: 16th and 17th February.
Allora: 7th and 8th March.
Clifton: 14th and 15th March.
Tara: 21st March.
Milmerran: 20th March.
Goombungee: 28th March.
Pittsworth: 4th and 5th April.
Warwick: 10th and 12th April.
Toowoomba: 16th and 19th April.
Rosewood Camp Draft: 7th April.
Oakey: 28th April.
Taroom Camp Draft: 30th April.
Taroom: 1st and 2nd May (Rodeo, 5th May).
Dalby: 2nd and 3rd May.
Beaudesert: 2nd and 3rd May.
Charleville: 8th and 10th May.
Nanango: 3rd and 4th May.
Blackall: 7th and 9th May.
Chinchilla: 8th and 9th May.
Crow's Nest: 9th and 10th May.
Boonah: 9th and 10th May.
Monto: 9th and 10th May.
Kingaroy: 10th and 11th May.
Ipswich: 15th to 18th May.
Mitchell: 16th and 17th May.
Wondai: 17th and 18th May.
Roma: 22nd to 24th May.
Gympie: 23rd and 24th May.
Kalbar: 26th May.
Goomeri: 29th and 30th May.
Wallumbilla: 30th and 31st May.
Maryborough: 1st, 2nd, and 4th June.
Childers: 5th and 6th June.
Marburg: 1st and 2nd June.
Bundaberg: 7th to 9th June.
Lowood: 8th and 9th June.
Rockhampton: 19th to 23rd June.
Mackay: 26th to 28th June.
Laidley: 27th and 28th June.
Townsville Rodeo: 30th June.
Bowen: 4th and 5th July.
Gatton: 4th and 5th July.
Kilcoy: 5th and 6th July.
Townsville: 10th to 12th July.
Woodford: 12th and 13th July.
Rosewood: 13th and 14th July.
Cleveland: 13th and 14th July.
Cairns: 17th to 19th July.
Charters Towers: 18th and 19th July.
Caboolture: 20th July.
Nambour: 18th and 19th July.
Pine Rivers: 27th and 28th July.
Royal National: 6th to 11th August.
Imbil: 7th and 8th September.
Beenleigh: 20th and 21st September.
Malanda: 26th and 27th September.
Kenilworth: 29th September.

HOW TO MAKE A ROPE PIG-NET.

E. J. SHELTON, H.D.A., Instructor in Pig Raising.

IN the transport of pigs to rail, sale, show, or market, per wagon, truck, cart, or other open conveyance, some form of net or cover is required to prevent the pigs escaping and to protect them from injury or mishap. The rope pig-net illustrated and described in this article is the type usually recommended for the purpose, for it has the advantage of being simple in structure, easily contrived by the handy man, and is inexpensive, withal durable and convenient.

It is worthy of mention, however, that it is not a sunshade and will not protect the pigs from the blistering effects of the sun when they are exposed to its direct rays as they frequently are when removed from cool protected sties and placed in the cart or wagon for transport by road to the township or trucking station. This suggests the necessity of providing some form of shade or protection, even if it is only a few green bushes or a wet bag or two.

It is important that bacon pigs en route to the factories, and store or pork pigs en route to sales, &c., should be thus protected in order that they will arrive at destination in good order and condition, and, in the case of the bacon factory, free from sunburn or sunscald or other ill-effect.

The method of procedure in the making of a pig-net such as is illustrated herewith is extremely simple, and should be readily understood by all concerned. The materials required are rope and a length of softwood or hardwood board rounded at the edges and 12 to 18 inches long and of the same width at both ends. This piece of board is referred to by net makers as the mesh stick, its principal use being to keep all the meshes the same size. In actual use a mesh stick 2 inches wide will make a 4 inch mesh; a 3-inch stick a 6 inch mesh, &c. The objective is to have the stick half the width of the mesh it is intended the net shall carry.

In measuring the meshes it is necessary to draw them out to a diamond shape. The 4-inch mesh is preferable for bacon or pork pigs, a smaller mesh for suckers and weaners. Where fishermen set out to fashion a fishing net they use a long needle and the cord is held on a reel or short length of timber, but in the case of a pig net the rope had better first be rolled up in the same way as the ordinary rope clothes line or sash cord is when purchased; it will then be a simple matter to pass the hank of rope through the loops when making the knots at the corner of each mesh, for the knotting is rapidly performed by an experienced worker.

The Method.

In setting out to make the net, first tie a loop in one end of the rope as in A, Figure 1. Place this knot on a strong spike or hook attached to a post or wall or some other convenient place as at A in Figure 2. Now place the mesh stick under the loop as at B, put the rope around the mesh stick, then pass the rope through the loop and pull rope tight, proceeding to place the thumb of the left hand on the rope beyond the loop as at A in Figure 3, and with a turn of the wrist of the right hand throw the rope to the position shown at B. Next pass the rope behind the loop C, and then through the bight of B and down as at D; draw knot tight, which should now assume the shape indicated in Figure 4. This figure shows the knot made loosely to enable the method of making it to be clearly seen and readily understood. The rope must be held firmly with the thumb at A, Figure 3, when pulling up the knot, as on this depends the uniformity of the shape and size of mesh.

To continue the netting, the stick is withdrawn and placed under A, Figure 4. The rope is then passed around the stick as in Figure 2 and brought through the loop A, Figure 4, and the process shown in Figure 3 is repeated to form another mesh, this being continued to make a chain of meshes, say, the width of the conveyance to be used when transporting the pigs to rail or sale. The loop A, Figures 1, 2, and 5, first tied is then untied and it will be found that all the meshes are equal in size. Next the chain of meshes is opened out at right angles to the line in which it was made, as shown in Figure 6; in other words, remove the chain of meshes from a vertical position as in Figure 5 and place them in a horizontal position as in Figure 6. A line is run through the meshes D, E, F, G, and secured between two posts to hold the net while continuing the meshing. Working across is then begun by making a mesh at A, Figure 6, then at B, C, and so on until the length of the first lot of meshes has been reached, when the right-hand side of the net is turned around and placed where the left-hand side was and the left hand side placed where the right-hand side was. Another row of meshes is started on the left-hand side (facing the net) and worked until the one under A has been reached on the right-hand side.

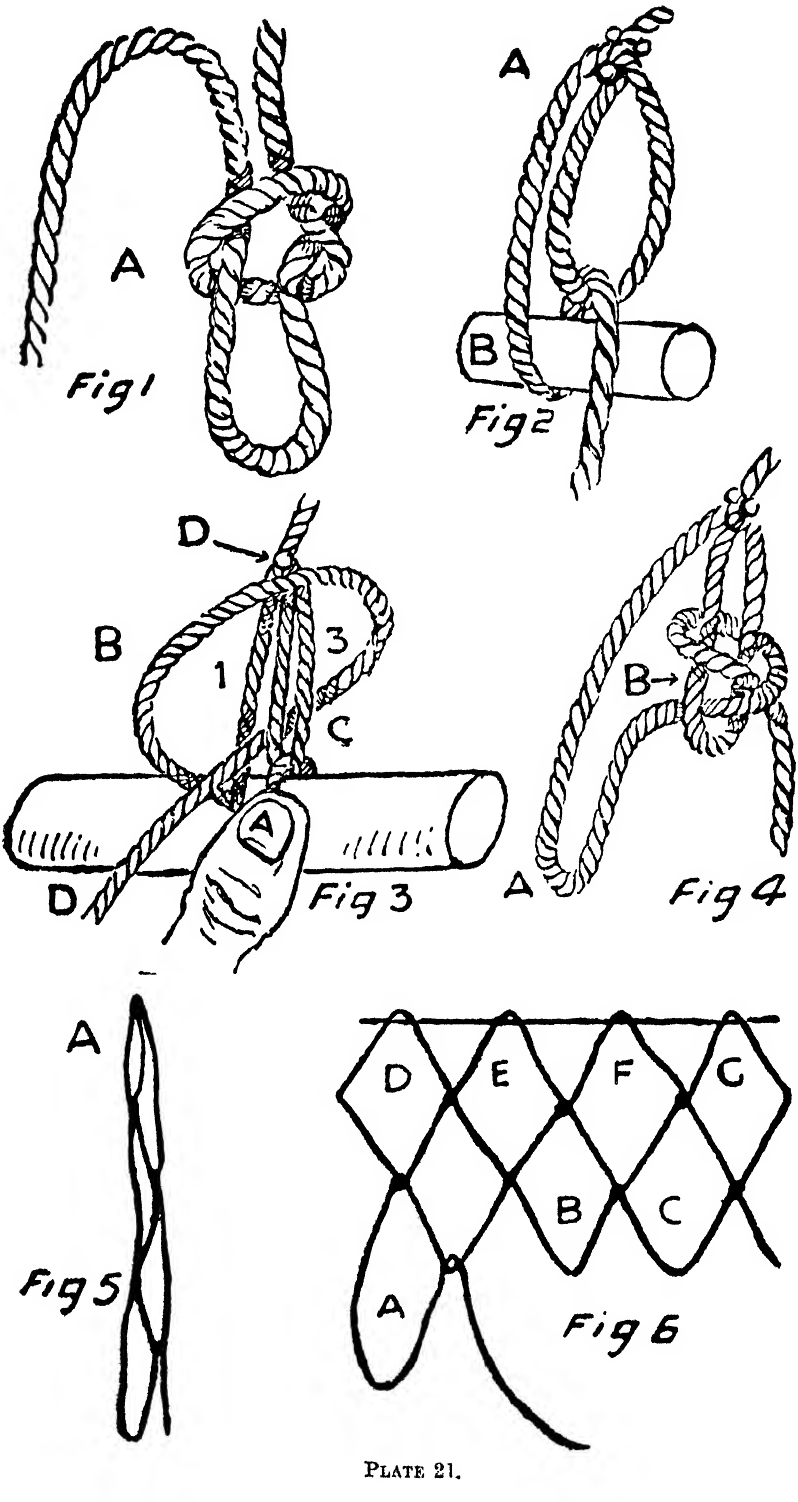

PLATE 21.

The net is turned again, and another row of meshes commenced on the left-hand side, and so on until there are enough rows of meshes to cover the vehicle. To secure the net to the vehicle use rope plough lines, and reeve them through each mesh and around the side and end rails of the body of cart. The method described herein of making the meshes is the same as is used in making ordinary hammocks.

Rope pig-nets may be purchased at most country stores, or if not on hand could readily be ordered, but it is neither an expensive or difficult task working one up, and from the instructions given above and illustrated any handy person should be able to complete the job. If wet bags are being used as a cover when the pigs are loaded, tie the bags to the net at each corner of bag; this will save inconvenience and loss, and will be more satisfactory.

It is preferable that the net and bags should be at least twelve inches above the backs of the pigs, otherwise the net is inclined to rub and injure the flesh and blister the skin. Every possible care and attention should be given to see that this does not happen, hence it is desirable that the net be made six or more inches wider than the vehicle on which it is to be used.

In loading secure the net on both sides and in front, first leaving a good length of plough rein free to tie the net to rail of tailboard when pigs are loaded and vehicle is free from loading race.

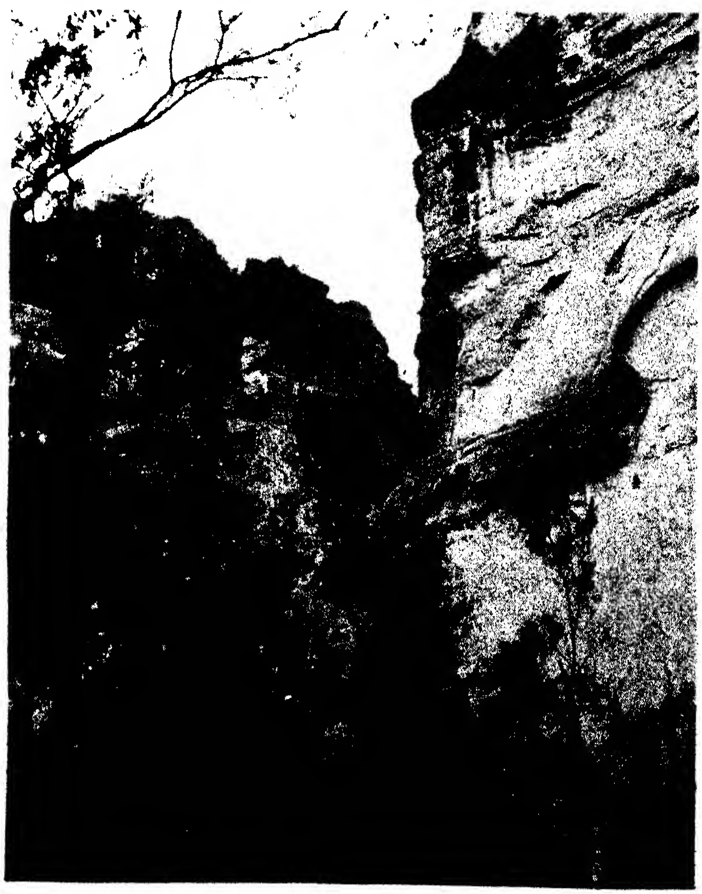

PLATE 22.

A deep, rock-walled ravine in the Carnarvon Range, a "newly-discovered" scenic region in Queensland's Middle West remarkable for its wild beauty, and abounding in native game.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Friesian Cattle Club, production charts for which were compiled for the month of November, 1933 (273 days period unless otherwise stated):—

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COWS (OVER 5 YEARS), STANDARD 350 LB.			
Gentle 2nd of Blacklands (365 days)	H. D. Giles, Biggenden	11,210	504·095	Sir Hugh of Hillview
Primrose of Trevor Hill	G. Gwynne, Umbiram	11,045·6	448·973	Prince of Braemar
Carnation of Trevor Hill	A. E. Vohland	10,492·8	429·362	Prince of Braemar
Betty of Lyndith	S. H. Teese, Veresdale	11,731·06	423·001	Karl of Ashbourne
Bluebell 3rd of Happy Valley	R. R. Radel, Coalstoun Lakes	8,266·95	370·914	Chief of Hillview
	JUNIOR, 4 YEARS OLD (UNDER 4½ YEARS), STANDARD 310 LB.			
Velvet of Trevor Hill	G. Gwynne, Umbiram	8,585·1	369·427	Prince of Braemar
Voco of Wilga Vale	C. O'Sullivan, Ascot, Greenmount	8,968·15	349·535	Reliance of Blacklands
Violet of Trevor Hill (269 days)	G. Gwynne, Umbiram	9,191·2	347·288	Prince of Braemar
	SENIOR, 3 YEARS OLD (OVER 3½ YEARS), STANDARD 290 LB.			
Navilus Vera	C. O'Sullivan, Greenmount	11,038·69	392·95	Charmer of Glenleigh
	JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB.			
Kyabram Marie	A. H. E. Black, Kumbia	9,424·65	374·976	Ledger of Greyleigh
	SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB.			
Navillus Olive	C. O'Sullivan, Greenmount	9,249·5	365·816	Midgets Shiek of Westbrook
Rosemount Doreen 18th	P. D. Frechtner, *via* Greenmount	8,046·08	341·953	Bright Star of Cosey Camp
Millstream Molly	W. J. Barnes, Cedar Grove	8,041	323·335	Magnet of Kurrawong
Rosehill Dahlia	W. Flesser, Boyland	7,278·63	312·84	Philiquil of Oakvale
Kingsdale Bella	A. A. King, Mooloolah	6,801	285·761	Diamond Boy of Burradale

	JUNIOR 2 YEARS OLD (UNDER 2½ YEARS) STANDARD 230 LB.			
Lyndith Primrose	S. H. Teese, Veresdale	6,270.12	245.374	Brooklyn Terrace President
Euroa Rosebud	H. [illegible], Mundubbera	[illegible]	[illegible]39.214	Swagman of Clonagan
	FRIESIAN.			
	SENIOR 2 YEARS OLD (OVER 2½ YEARS) STANDARD 270 LB.			
Oaklands Stella Rock 4th	W. Richters, Tingoora	[illegible]207.74	310.644	[illegible] Rock
	JERSEY.			
	MATURE COW (OVER 5 YEARS) STANDARD 350 LB.			
Seycombe Glory's Garland	C. T. Seymour, Coalstoun Lakes	[illegible]	453.643	Carnation Royal
Seycombe Golden Peach	C. T. Seymour, Coalstoun Lakes	6,28[illegible]	371.592	Carnation Royal
Seycombe Genuine Gold	C. T. Seymour, Coalstoun Lakes	[illegible]	[illegible]	Carnation Royal
Seycombe Myrtle	C. T. Seymour, Coalstoun Lakes	[illegible]	[illegible]37	Carnation Royal
Seycombe Golden Glimmer	C. T. Seymour, Coalstoun Lakes	6,093.05	35[illegible].711	Carnation Royal
	JUNIOR 2 YEARS OLD (UNDER 2½ YEARS) STANDARD 230 LB.			
Glenview Larkspur	F. P. Fowler and Sons, Coalstoun Lakes	4,448.25	267.765	Carlyle Larkspur 2nd Empire
Glenview Milkmaid	F. P. Fowler and Sons, Coalstoun Lakes	4,22[illegible]	266.025	Carlyle Larkspur 2nd Empire

Answers to Correspondents.

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. Cyril T. White, F.L.S.

Wild Millet.

J. B. (Marbango, Western Line)—

The specimen is *Echinochloa crus-galli*, commonly known as Wild Millet. It is a good grass, very closely allied to the well-known fodders White Panicum and Japanese Millet, of which it is supposed to be one of the wild parents. It is widely spread over the warmer regions of the world, and several forms of it occur wild in Queensland. Seed of it is not stocked, so far as we know, by nurserymen, and if you wished to propagate the grass you would have to keep seed from your own plants.

Hop Clover.

G.B. (Gympie)—

The specimen is *Trifolium procumbens*, the Hop Clover, a native of Europe, now widely spread over most warm temperate countries. It is very common in parts of Australia, especially in the Southern States. In Queensland it makes its appearance in the winter months, seeds in the early summer, and dies off on the approach of the real hot weather. It is an annual clover not stocked by seedsmen, but once it establishes itself it generally comes back each year from self sown seed. Like most of the annual clovers, it makes good feed during the spring and late winter months when often other feed is not available. This year has been an exceptionally good year for clovers and trefoils.

Fuchsia Bush.

J.H.C. (Charleville)—

We know that trouble has been experienced on several occasions on the Quilpie Trucking Reserve, and think that Fuchsia Bush is the cause. Fuchsia Bush is plentiful on the town common, and when eaten by travelling stock, particularly on an empty stomach, no doubt this plant, like others containing a prussic acid-yielding glucoside, causes severe mortality. Many of these prussic acid yielding plants are eaten by ordinary browsing or paddock stock apparently without any ill-effects following. The mere fact that the town cows and the general grazing stock in the neighbourhood of Quilpie feed on the common, particularly on the Fuchsia Bush, without any ill effects following is no indication whatever of the plant's effect on travelling stock.

These plants are not common agricultural weeds, and no special means of eradication are known, other, of course, than grubbing-out. If desired, the plants could be sprayed with a weak arsenical solution, but the use of arsenical sprays is exceedingly dangerous where stock are running. A spray such as "Weedex," containing calcium chlorate, could be tried at about 5 per cent. solution. This weed spray is not known to be poisonous to live stock in a diluted form, but its efficacy in destroying hard woody plants such as those you send has not been tried out.

Candle Nut.

W.J.M. (Tirroan)—

The nuts forwarded with your letter of 13th November represent the Candle Nut, *Aleurites moluccana*. The name "Candle Nut" arises from the fact that the seeds are very oily and in certain parts of the South Sea Islands, particularly in the New Hebrides, they are strung together and burnt in the form of a candle. They burn with a fair flame and a great deal of smoke. The tree is a native of North Queensland, but is also spread over the Malayan Archipelago and the islands of the Pacific. The majority of people seem to eat the nuts with impunity, but occasionally one hears of cases of people being made violently ill through eating the nuts. Probably if the oil has turned the slightest bit rancid the nuts are dangerous, causing severe vomiting and diarrhœa.

Australian Centaury; Groundsel; Blue Panic; Giant Couch.

H.R. (Cooroy)—

The specimen is *Erythræa australis,* the Australian Centaury. This is a fairly common weed in paddocks in the coastal parts of the State from the Tweed to Wide Bay. The plant is not known to possess any harmful properties. It is, in fact, collected by some people and used as a tonic, the English Centaury being supposed to have considerable value in this respect.

The other specimen you forwarded under the name of Saltbush is the Groundsel Bush, *Baccharis halimifolia,* a native of South America, now a great pest on the North Coast line, particularly on the low-lying swampy country. Cattle eat this bush when hard pressed, but it has no fodder value. It has been suspected of possessing poisonous properties, but feeding tests carried out at Yeerongpilly some few years ago showed the plant to be harmless, though almost destitute of any nutritive value.

Regarding Blue Panic, *Panicum antidotale,* we should say the best time to plant this would be during the spring or summer. The present time future of *Panicum antidotale* will be more or less as a cultivated grass is excellent. As you say, root-planting is tiresome, though we think the in small paddocks of two to five acres as a standby for raising in the same way as an ordinary cultivated crop.

Have you tried *Brachiaria mutica,* better known as *Panicum muticum* or Giant Couch? This should be an excellent grass for some of the country about Cooroy. It is a tropical grass, and in the southern parts of the State is probably best handled in small paddocks for grazing purposes. We recently saw a small cultivated plot of it near Coolum, and were informed by the owner of the property that, when cultivated, this grass would carry up to three and four beasts per acre.

Gardenia Ochreata; Cocksburr Thistle.

O.L.H. (Mareeba)—The specimens forwarded with your letter of 17th November have been determined as follow:—

The tree from Mount Garnet is *Gardenia ochreata,* a small tree or large shrub of the family Rubiaceæ. It is fairly common in North Queensland but we have not heard a local name given to it. It bears a fair-sized fruit, but we do not think this is edible, though it is not known to be poisonous in any way. If desired to propagate the tree it should be easily propagated from seeds.

The weed from the farm at Kairi is *Centauria melitensis,* Cocksburr Thistle, or Saucy Jack, a native of Southern Europe, now a naturalised weed in most warm temperate countries. It is an exceptionally bad weed in New South Wales and in parts of South Australia. In Queensland it is very common on the Darling Downs, but is less abundant in more coastal localities. When quite young it is eaten by stock, but soon becomes harsh and unpalatable.

Derris; Pyrethrum.

K.A.E. (Landsborough)—

We have three native species of *Derris* in Queensland, which have all been tested as insecticides. The best is *Derris trifoliata,* common in the north-eastern parts of the State, particularly from Mackay northwards. It also occurs in New Guinea and the islands of the Pacific, where it is known as Dynamite Plant on account of the custom of the natives of chopping up parts of the stem and throwing them in water to stupefy fish.

Regarding *Pyrethrum roseum,* the Department imported seeds of *Prethrum* some time ago and distributed them to several parts of the country. We should think as far as cultivation is concerned *Derris* would have more possibilities in Queensland than *Pyrethrum,* because the Japanese, we understand, flood the market with *Pyrethrum* at a very low price.

Mossman Grass.

J.J. (Marlborough)—

The specimen is *Cenchrus echinatus,* a grass that is said to be a native of tropical America, but is now widely spread over most tropical countries. In Queensland it is most abundant in the north-eastern parts of the State. It is a bad burr grass, and, we should say, would have little value as a fodder. In North Queensland it is commonly known as Mossman Grass or Mossman River Grass.

Cotton.

J. INMAN (Goodenough Island)—

The Director of Cotton Culture, Mr. W. G. Wells, advises:—The sample of cotton submitted is probably a descendant of the old Caravonica variety. Sample rather weak for this type, variable in length, ranging from 1 1/16 in. to 1¼ in. Difficult to estimate value, owing to limited demand for this type of cotton.

Black Bean or Moreton Bay Chestnut.

C.F.F. (Kairi)—

The specimen is the seed of *Castanospermum australe*, the Black Bean or Moreton Bay Chestnut. The seed, when eaten by cattle, causes severe gastro-enteritis, sometimes resulting in death.

C.B.P. (Barcaldine)—

The specimen bore neither flowers nor seed pods, but we should say it represents the rather young growth of the Rubber Vine, *Cryptostegia grandiflora*, a shrub or vine that is cultivated in Northern and Central Queensland as an ornamental plant. In some places it has run out and become more or less of a pest. No feeding tests have been made with the plant, but it belongs to a dangerous family. If the calf had been feeding on the plant we think it is most likely the cause of the trouble.

Method of Polishing Bullock Horns.

N.L.P. (Jambin, Callide Valley)—

The Senior Instructor in Pig Raising, Mr. E. J. Shelton, has kindly supplied the following information:—

Method 1.—To polish bullock horns, first soak them in warm water until the core can be removed. Smooth by rasping, scraping with the edge of glass and sand paper, using fine emery paper last; then rub with a cloth moistened with linseed oil dipped in emery powder, finally rubbing and polishing with the hands. They may be more readily handled by tapping in a piece of wood and holding in a vice.

Method 2.—Scrape well with glass and afterwards rub with finest glass paper; then with powdered bath brick and oil, and finally with rotten stone and flannel or felt. Scrape with glass to remove any roughness; then grind some pumicestone to powder or buy it in powdered form, and with a piece of cloth wetted and dipped in the powder rub them until a smooth face is obtained. Next polish with rotten stone and linseed oil and finish with dry flour or a clean piece of linen.

Method 3.—Rasp them to take the outside rough shell off, then scrape well till the colour shows up, using rough sandpaper; then scrape and finish with a fine piece of glass. For polishing use vinegar and whiting and finsh with a piece of silk.

Another method is, after taking off all rough surfaces, to fill the horns with kerosene till it penetrates through. Pour out then and polish with oxide of tin and rub with a kerosene rag till all scratches are out. Then with a little dry powder on finish off with friction with a soft hand or piece of silk. Any of the ingredients mentioned above can be purchased through local stores in the country or at city stores.

Tanning Wallaby Skins.

N.L.P. (Jambin)—

The length of time it takes to tan a wallaby skin by the brigalow-bark process would depend entirely on the strength of the tan liquor used and the size of the skin. Brigalow bark is rarely if ever used in commercial tanning, the wattle bark method being considered superior in every way; in New South Wales oak bark is mostly used as an alternative to wattle bark where the latter is not available, and takes about the same time.

Some tanners consider brigalow bark tanning only suitable for hard leather like sole leather, and not as suitable a bark as wattle bark for marsupial skins.

Blue gum bark is also to be preferred, although it is a slower process.

Time taken always depends on the thickness and size of the skin, but it is usually from two to four weeks, and if fur is left on they only tan from one side through the pelt. It is suggested as a wise procedure to cut off a small portion to try the tan and time taken. If any white patches are observed the skin is not properly tanned and will be soft and will not keep well.

Plant Affecting Pigs (*Teucrium argutum*).

G.B. (Gympie)—

The specimen is not the plant familiarly known as Wild Mint, which has come into prominence so much of recent years as the probable cause of losses in stock on the Darling Downs. It belongs to the same family, however. It is *Teucrium argutum*, a plant for which we have not heard a common name. It is seen in pastures, also in cultivation. It develops large white underground runners. These, when turned up by the plough, are greedily sought after by pigs. It sends them into a very excited state and they rush madly about. They recover after a short time.

Sudan Grass, Its Poisonous Properties; *Paspalum Urvillei.*

A.L. (Ipswich)—

In reply to your inquiry about the poisonous properties of Soudan grass, the Agricultural Chemist advises that fatalities with Soudan grass are very rare. As a rule grazing on this grass is fairly safe. Experience shows that the poisonous principle when it develops is most likely to occur in the very young growth stages. The poisonous principle is much more rare in Soudan grass than in the common Sorghum.

The sample of grass you send is *Paspalum Urvillei*. This is closely allied to the common *Paspalum*, but is inferior to it in palatability and nutritive properties.

PIG RAISING.

Replies selected from the outgoing mail of the Senior Instructor in Pig Raising, Mr. E. J. Shelton.

Spots on Large Whites—Crown on Rump.

R.A.S. (Abercorn)—

(1) With regard to blue spots or freckles on the skin of Large White pigs, it is apparent that this objectionable feature appears in the White breeds the world over and is one of the faults to be guarded against. The standard of excellence printed on page 56 of the current issue of "The Australian Stud Pig Herd Book," states, in regard to colour, skin, and hair—

"Hair white, free from black hair, and as far as possible free from blue spots on the skin; skin fine and free from wrinkles; hair long and moderately fine -10 points."

It is apparent from this that blue spots on the skin would not debar an animal from competition, but of course it is quite possible and more than likely that a judge would eliminate animals showing more than one or two blue spots. Strangely enough, these blue spots usually occur just above the eyes and under the ears, though why this should be is difficult to explain. We have always regarded spots on any other part of the body as more objectionable than spots above the eyes, and we know other judges who do the same. Quite recently, in an inspection of a litter of Large Whites, several pigs were noticed with probably twenty blue spots distributed over the rump and loins, and it would not be difficult to understand in this case that these animals would be debarred from competition; nor should they be used as breeders on account of risk of transmission.

(2) *Crown on the Rump.*—The following may be regarded as distinctly objectionable features in Large White pigs:—Black hairs, black spots, a curly coat, a coarse mane, short snout, inbent knees, hollowness at back of shoulders; in fact a few years ago these objections were published with the standard of excellence. A crown or swirl or cowlick on the hair of rump or back is, in our opinion, very objectionable from a show point of view, although there are no instructions in the herd book that they are to be regarded as such. Like the blue spots, there is always the risk of transmission of these faults to the progeny, and as the "very best" only should be used as breeders animals with faults like this should be culled. They could be used for crossbreeding. We are also of opinion that, if a stud breeder sells faulty animals as stud stock he is not keeping faith with the Society, which trusts breeders of stud pigs to sell none but the best approved animals, and on that account does not pay inspectors.

The better marked animals are always worth a guinea or two more than mismarked stock, and it is up to breeders to sell the very best.

The Pig's Diet.

M.A.B. (Yelarbon)—

The Director of the Animal Health Station will advise you fully in regard to the health of your pigs, but, dealing with the question from a dietetic point of view, the trouble appears to be due to the feeding of indigestible fibrous matter leading to constipation and general digestive disorders. These chronic troubles weaken the animals to such an extent that paralysis sets in and they are then prone to develop other nervous and constitutional troubles, and perhaps to suffer severely from the effects of stomach and intestinal worms and possibly from bush tick poisoning—also a common cause of paralysis in young pigs.

You state that the pigs are nine months old and are only in forward store condition. This indicates a serious lack of knowledge in the feeding and care of pigs, for pigs should be marketed as prime baconers before they are six months old if they are to be profitable, and as heavy baconers before seven months of age, and at that age probably they would be too heavy for best market requirements.

Perhaps they are slow-growing because they are not properly fed or, may be, it is their breeding, care, and attention that is at fault, just as much as their feeding. It may so happen that they have been fed on decaying curd or the thick dry curd that forms on the sides of milk vats, &c., and that loosens during wet weather, and in falling into the food contaminates it to such an extent as to make it poisonous (protein poisoning); or it may so happen that the pigs may have died of heatstroke caused by exposure to the sun and by lack of sufficient drinking water. These are all possible causes, and in the absence of inspection you will realise it is difficult to locate the exact cause. The district Stock or Dairy Inspector would advise you in your difficulty.

Change the pig's food—add tablespoonful doses of cod liver oil to those that are sickly. Keep the bowels open by repeated doses of epsom salts and the use of plenty of green lucerne or other green food, and compel the pigs to take regular daily exercise in a clean grassy paddock.

DAIRYING.

Lime in Calf-feeding.

A.B. (Nanango).—The Supervisor of Dairying, Mr. Chas. McGrath, advises as follows:—

Lime is a necessary constituent for all classes of domestic animals. The addition of lime to the milk fed to calves is recommended. It renders the curd portion of the milk more readily digestible and acts in correcting acidity in the stomach, and adds to the supply of lime for bone formation.

Lime water can be conveniently made available on the dairy farm. Water will dissolve only a definite amount of lime, 10 grains to a pint.

To prepare a stock of lime water add about 20 lb. lime to 10 gallons of water in a wooden barrel, and stir thoroughly. Then allow to settle. Smaller quantities could be prepared in earthenware or glass containers. The clear liquid present on settling is a strong (concentrated) lime solution ready for use. A wineglass full (2 oz.) should be added to each gallon of skim milk fed to the calves.

Water may be added to the stock supply of lime water as required and well stirred until all the soluble portions of the lime are dissolved, when a fresh supply of lime should be added to the barrel and well stirred.

When calves are put on to a skim milk diet a concentrate should be added to replace the butter fat. There are a number of suitable calf foods on the market.

A gruel can be made from 3 lb. crushed linseed and 2 lb. pollard added to 4 gallons of water and carefully mixed so as to avoid lumps forming. Boil slowly for thirty to forty minutes. One pint of the gruel should be added to each gallon of skim milk to be fed to the calves. A small quantity of the gruel or a calf food could be added when it is first fed to the calves, so that they may get accustomed gradually to the flavour, as the full allowance may cause the calves to refuse the food or may cause digestive disturbance.

CROWN LAND FOR GRAZING SELECTION.

APPROVAL has been given for the opening for prickly-pear development grazing homestead selection of land which was formerly heavily infested with prickly-pear in the Roma and Goondiwindi Land Agents' Districts.

One portion in the Roma Land Agent's District, comprising 10,352 acres, will be opened at the Land Office, Roma, on Tuesday, 6th February, 1934, for a term of lease of twenty-eight years, at an annual rental of ½d. per acre. This portion is situated 5 miles north of Yeulba, and is suitable for grazing cattle. The selection of this land will be subject to the ringbarking of 3,000 acres and the provision of one permanent water improvement during the first five years of the term.

Ten portions in the Goondiwindi Land Agent's District, situated from 16 miles to 60 miles north and north-west of Goondiwindi, will be opened at the Land Office, Goondiwindi, on Thursday, 8th February, 1934, for a term of lease of twenty-eight years, at annual rentals of ¼d. and ⅜d. per acre. The areas range from 8,800 acres to 30,000 acres, and one portion, which is suitable for sheep, is subject to a condition that it shall be enclosed with a fence which is both rabbit-proof and marsupial-proof, within three years from the date of the license to occupy. The remaining nine portions comprise cattle country.

Each portion is subject to special conditions requiring the ringbarking of areas ranging from 2,650 acres to 7,000 acres, and the provision of permanent water improvements within specified periods.

Free lithographs and full particulars of these lands may be obtained from the Land Agents, Roma, Dalby, and Goondiwindi, the Land Settlement Inquiry Office, Brisbane, and the Government Intelligence and Tourist Bureau, Sydney.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

General Notes.

Staff Changes and Appointments.

Mr. W. C. Jeffery, of Round Hill, Miriam Vale, has been appointed an Honorary Ranger under the Animals and Birds Acts in respect of the Captain Cook Memorial Reserve at Round Hill, which was recently declared a sanctuary under the Acts.

Mr. E. Jarvis, Entomologist, Meringa, will be transferred to Brisbane, and Mr. R. W. Mungomery, Assistant Entomologist, Bundaberg, will be attached to Meringa.

Messrs. J. Gunne (Helidon), J. J. Shelvey (Helidon), R. Pusey (Grantham), A. W. Noll (West Haldon), and J. Bishop (Kingaroy), Inspectors of Stock, Department of Agriculture and Stock, have been appointed also Inspectors under the Dairy Produce Acts.

Constable J. C. D. Doyle, Eulo, has been appointed also an Inspector under the Slaughtering Act.

Mr. F. J. Lentz, Numinbah, has been appointed an Honorary Inspector under the Diseases in Plants Acts.

Messrs. G. Bradbury and W. Harward, of Dunwich, have been appointed Honorary Rangers under the Native Plants Protection Act.

Messrs. F. R. Hugonin and A. Kehler, Magnetic Island, have been appointed Honorary Rangers under the Animals and Birds Acts.

Messrs. W. G. Hancock and K. King, agents under the Banana Industry Protection Act. have been transferred from Currumbin to Maryborough, and Maryborough to Currumbin, respectively.

Mr. J. W. Madill, of the Mirani Shire Council, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Mr. S. A. Green, Inspector, Diseases in Plants Acts, Wallangarra, has been appointed also an Inspector under the Diseases in Stock Acts.

Banana Levy Regulation.

A regulation has been issued under the Fruit Marketing Organisation Acts, empowering the Committee of Direction of Fruit Marketing to make a levy on growers of bananas in Queensland, with the exception of those growers in the district from Nerang to the border, for whom a special levy regulation was issued in September last.

The levy is at the rate of one penny for every £2 or part thereof of the net proceeds from sales, and may be collected by agents, or persons holding to the credit of growers money on account of banana sales. The levy shall be collected by means of levy stamps obtainable from the C.O.D., which shall be affixed to account sales or credit notes.

In the case of bananas sold privately, the grower shall furnish a return of such sales to the C.O.D., and pay the levy due. Carriers of bananas shall furnish a monthly return to the C.O.D. of all fruit carried for market.

The sums raised by the levy shall be expended in the interests of the banana industry.

Levy on Stanthorpe Fruit and Vegetables.

A regulation issued under the Fruit Marketing Organisation Acts, empowers the Committee of Direction of Fruit Marketing to make a levy on growers of fruit and vegetables in the district being that portion of the State within a radius of 40 miles from Wallangarra, and in which area are situated the railway stations of Wallangarra to Dalveen, and Amiens to Fleurbaix. The levy will operate for a period of twelve months. The levy is at the rate of 1s. 6d. per ton of fruit and vegetables marketed, with a minimum of 1d. in respect of any one consignment by a grower who, in his own name or otherwise, contributes fruit or vegetables to any consignment. The levy this year replaces one of a lesser figure which has operated for about six years. The increase from 10d. to 1s. 6d. is made, firstly, for defraying the cost of the collection of the levy, and secondly, the balance shall form part of the Hail Relief Scheme Fund for the benefit of the growers in the district. The former levy of 10d. per ton was for the maintenance of the Deciduous Sectional Group Committee, although the bulk of the amount realised was actually used for hail insurance. This year, the whole of the proceeds, less cost of collection, will be devoted to hail relief.

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Egg Board.

An Order in Council issued under the Primary Producers' Organisation and Marketing Acts, extends the operations of the Egg Board from 1st January, 1934, to the 31st December, 1938. An Order in Council was issued in October last, giving notice of intention to extend the Board, and inviting a petition from growers on the question of the continuance thereof. No petition was received, and the Order in Council formally extending the Board has accordingly now been issued.

Grade Standards for Plums.

A new regulation issued under the Fruit and Vegetables Act rescinds the existing grade standards for plums, and prescribes new standards. For the purposes of comparison, the following table sets out the grade standards approved in November, 1932, and those now approved:—

1932.—1¼ inch—Little Gem, Evans Early, Blue Rock, Tibbits, Early Orleans. 1¾ inch—Doris, Duffy's, Wright's Early, Santa Rosa, Wilson, Angelina Burdett. 1½ inch—Burbank, Giant Prune, Pond's, President, Grand Duke, Black Diamond, Magnum Bonum, Coe's Golden Drop, Kelsey, Wickson, Ballina, Shiro, Beauty, Formosa, Sultan, October Purple.

1933.—1⅛ inch—Early or Little Gem, Evans Early, Blue Rock, Tibbits, Early Orleans. 1¼ inch—Doris, Duffy's. 1⅜ inch—Wilson, Angelina Burdett, Wright's Early, Santa Rosa, President, Grand Duke, Giant Prune. 1½ inch—Burbank, Pond's, Black Diamond, Magnum Bonum, Coe's Golden Drop, Shipper, Kelsey, Wickson, Ballina, Shiro, Beauty, Formosa, Sultan, October Purple, Narrabeen.

Cotton Board Election.

The election of six members on the Cotton Board resulted as follows:—

District No. 1—

* John Beck (Stanwell) returned unopposed.

	Votes.
District No. 2—	
* Harry Reeves Brake (Wowan)	149
William Kendall McLeod (Buneru)	76
District No. 3—	
* James Patrick Fleming (Biloela)	267
Ernest Schuenemann (Goovigan)	219
George Herbert Bradley (Argoon)	96
District No. 4—	
Edward James Basson (Three Moon, Monto)	194
* James Bryant (Chowey)	177
Johann Theodor F. C. Benecke (Abercorn)	86
Samuel Harding (Philpott Creek)	66
Erich Max Schenider (Bonjour Plateau)	66
District No. 5—	
* David Charles Pryce (Toogoolawah)	152
Charles Litzow (Vernor)	54

District No. 6—

* Ferdinand August Kajewski (Ma Ma Creek) returned unopposed.

* Present member.

All of the sitting members with the exception of Mr. James Bryant have been re-elected and they will be appointed together with Mr. Basson to hold office for a term of two years as from the 1st January, 1934.

Papaw Levy.

A Regulation has been issued under the Fruit Marketing Organisation Acts empowering the Committee of Direction of Fruit Marketing to make a levy at the rate of 1d. for every four cases of papaws marketed during the period from 1st January, 1934, to 31st December, 1934. The regulation prescribes the method of collection of the levy, and provides that all sums raised thereby shall be expended only upon advertising in the interests of papaw growers.

State Wheat Pool Extended.

A Proclamation has been issued under the Wheat Pool Acts, declaring that the provisions of these Acts shall apply to wheat harvested during the seasons 1933-34, 1934-35, 1935-36, 1936-37, and 1937-38. The present Pool automatically expires when the last of the wheat raised in the 1932 33 season is marketed.

A provision is included in the Proclamation that 500 growers of wheat—

(*a*) Who furnished to the State Wheat Board a return of wheat grown on land of which they are the owners or tenants for the 1932-33 season; or

(*b*) To whom seed wheat has been supplied by the Board for this year's planting for delivery of the resultant grain to the Board from not less than 10 acres of land of which they are the owners or tenants; or

(*c*) Who have grown wheat for delivery to the Board from an area of not less than 10 acres of land of which they are the owners or tenants,

on or before 8th January, 1934, may make a request for a poll on the question whether or not they desire the continuance of the Wheat Pool for a further period of five years.

Northern Pig Board.

Mr. D. Johnston, of "Hillcrest," Malanda, has been elected chairman of the Northern Pig Board in succession to the late Mr. H. T. Skennar. The other board members include Messrs. Robert Campbell (Peeramon), Mr. F. W. Collard (East Barron), J. E. Foxwell (Kureen), A. A. Knudson (Millaa Millaa), and E. Graham (Director of Marketing).

The Board has been appointed from the 1st January, 1934, until the 31st October, 1934, in continuation ot the work carried out during the several years past. The Board elects its own secretary, Mr. C. Dunlop, manager of the North Queensland Co operative Bacon Association, Limited, having occupied this position in the past as the Bacon Factory at Floreat Siding, Mareeba, functions under the general oversight of the Board. The latter takes the form of a commodity board functioning under the Council of Agriculture in Queensland, and in that capacity controls the marketing of pigs in the Atherton Tableland and Cairns Hinterland districts of North Queensland. The Board has performed a very useful and necessary service, and in co-operation with the bacon factory has resulted in the permanent establishment of the pig industry in that portion of the State.

Citrus Standards.

The Minister for Agriculture and Stock (Mr. Frank W. Bulcock) announced recently that Regulations had been issued under the Diseases in Plants Acts, which were designed to safeguard the interests of future planters of citrus orchards, and to raise the standard of production of this fruit in Queensland.

The new regulations are the outcome of a scheme formulated by the Acting Director of Fruit Culture (Mr. H. Barnes) for the use by nurserymen of selected seed for raising root stocks, and budwood which has been specially selected by, or under the supervision of, an officer of the Department of Agriculture and Stock, from trees of outstanding merit.

In effect, added Mr. Bulcock, the new regulations provide that all citrus trees sold or offered for sale in this State must be on stocks grown from specially selected seed. In addition two grades are provided. "A" grade consists of the following best varieties:—

Oranges—Washington Navel, Valencia Late, Joppa, Jaffa, and White Siletta,
Mandarins—Emperor, Beauty of Glen Retreat, and Scarlet,
Lemons—Lisbon and Villa Franca,
Grape Fruit—Marsh Seedless,

which have been worked with budwood specially selected by, or under the supervision of, an officer of the Department of Agriculture and Stock.

"B" grade consists of all other varieties of citrus, the budwood for working which must be specially selected by nurserymen from trees displaying desirable charactertistics.

It is further necessary for all nurserymen who raise citrus trees for sale to furnish a return to the Director of Fruit Culture by not later than the 31st October in each year, setting out the names and addresses of persons to whom "A" grade citrus trees were sold, and the number of trees of each variety sold to individual purchasers. By this means a careful check will be kept on the sale of citrus trees to ensure that growers will be supplied only with the very best.

Heavy Citrus Crop in Prospect.

The Minister for Agriculture and Stock (Hon. F. W. Bulcock, M.L.A.) announced recently that he had received a report from the Acting Director of Fruit Culture (Mr. H. Barnes) that excellent early spring rains have been experienced over practically the whole of the main citrus growing areas of the State, and there are now prospects of a heavy crop of this fruit during the coming season. It is likely there will be at least a 50 per cent. increase over last season's yield. A factor which should react very much in favour of the Queensland growers is that the early rains caused the trees to blossom earlier than usual in many districts. The fruit as a result is well forward, and much of it should find a good sale in Sydney and Melbourne before the Southern fruit is matured enough to market.

Bird Sanctuary at El Arish.

Clump Mountain Farm, the property of Mr. R. C. Fenby, at Clump Point, El Arish, has been declared a sanctuary under the Animals and Birds Acts. It will accordingly be unlawful for any person to take or kill any animal or bird on this property.

Animals and Birds Sanctuaries.

Two more sanctuaries for the protection of animals and birds have been declared under the Animals and Birds Acts, and comprise the Toomba Stud Holding west of Charters Towers, and the property of Mr. St. J. Robinson, at Townsville. Part of the lastmentioned property was declared a sanctuary in June, 1930, but the Order in Council issued recently provides for the extension of the sanctuary to include adjacent breeding grounds for birds.

Mr. C. Fuller (Mapleton), C. M. R. Glover (Obi Obi), H. Bishop (Kidaman Creek), C. J. Mitchell (Kidaman Creek), H. N. Gannon, J. Cochrane, and K. Baedelt (Woodbury, via Yeppoon) have been appointed Honorary Inspectors under the Diseases in Plants Acts.

Mr. J. C. Cuthbert, Toll Gatekeeper of the Mount Nebo road, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Tung Oil Nuts.

As numerous inquiries have been received for seed of the Tung oil tree from persons desirous of experimenting in its growth, the Department of Agriculture and Stock has made arrangements whereby limited supplies of Tung oil nuts (*Aleurites fordii*) have been made available for distribution at the rate of 1s. 3d. per lb., including postage.

Applications, together with a remittance to cover the amount of the order should be forwarded to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Cane Assessment at the Kalamia, Pioneer, and Inkerman Mills.

An Order in Council issued under the Regulation of Sugar Cane Prices Acts fixes the assessment that may be levied on every ton of sugar-cane received at the Kalamia, Pioneer, and Inkerman sugar mills at 2¼d. per ton. This Order in Council amends the Order in Council issued on the 5th May, 1933 (which fixed a general assessment of 1¾d. per ton on sugar-cane received at any mill in the State) in respect of the three mills abovementioned, the levy of 2¼d. to apply as from the 5th May last.

The proceeds of this assessment are to be utilised in paying for the checking by survey of the correct areas of the cane lands assigned to the mills mentioned. This checking is necessary to enable the Central Cane Prices Board to issue official certificates as to the assignment of particular areas of land.

Egg Board.

The time fixed for the lodging of a petition in connection with the continuance of the operations of the Egg Board for a further term of five years closed at the Department of Agriculture and Stock recently, and for the first time no petition for a poll was received.

With regard to the election of five growers' representatives for a term of one year, four of the present members—namely, Messrs. R. B. Corbett (Woombye), District No. 1, A. A. Cousner (The Gap), District No. 2, Tom Hallick (Mount Gravatt), District No. 3, and Walter Thos. Hughes (Middle Ridge, Toowoomba), District No. 5—have been returned unopposed.

In District No. 4 Mr. Alexander McLauchlan (Boonah), the present member, is being opposed by Mr. H. J. Jurgensen (Moogerah).

Voting papers for this election will be sent to growers early this month, and the date fixed for their return is on or before December 29th.

Rural Topics.

Milking Capacity of Dairy Cows.

After recording the milk yields and taking detailed measurements of 461 pedigree and grade Holstein Friesian cows in Minnesota (U.S.A.), Mr. F. H. Garner writes interestingly in the "Journal of Dairy Science" about the relationship that he found to exist between the measurements of different parts of the animals and their milk- producing ability.

With regard to measurements indicating mammary development, the writer points out that the blood leaves the udder by six different veins, and that only two of these, the so-called milk veins, are visible. Where the veins turn suddenly upwards, some 6 to 12 inches from the forelegs, the milk wells are produced. The question arose as to whether the milk-wells were larger on bigger cows not because of higher milk yields but to be proportionate to the frames of the cows. It was found that the size of the cow did not materially influence the size of the milk-well. Measuring size by the height at the hocks, and holding this figure constant, a positive correlation was obtained between size of milk-wells and milk yield.

The writer concludes that the total area of the milk-well will take the tip of the middle finger of a normal man, and although one would never attempt to judge a cow by one point alone, the size of the milk-wells is probably the best single point indicating milk-producing ability. It is further stated thot there may be a close relationship between the size of milk-wells in parents and the milking capacity of their daughters.

The writer also found that it was important that a cow should have a long body; the relationship here was not much but nevertheless significant. He found that the height of the hindquarters of the cow was more highly correlated with milk yield than the height of the forequarters. The co-efficient of correlation between yield and width at the hocks was also significant, and bears out the opinion of judges who prefer a cow with a large pelvis girdle.

With regard to constitution, a significant correlation was obtained between the circumference of chest and milk yield, but not between depth and width of chest, though the writer concludes that these last two measurements could not be so accurately made as the first. "Capacity" was measured by the width of barrel at the thirteenth rib, and by the circumference of barrel, and again a significant correlation was obtained.

The Milker's Hands and Bacterial Infection.

Dairymen who milk with dirty hands should consider the effects their slovenliness might have, not only on dairy products, but on their fellow-beings. Often this carelessness is due, not to lack of personal cleanliness, but to want of knowledge of bacterial life. Let every dairyman have a look at his hands when dirty, and ask himself if he would like to see the baker from whom he buys his bread kneading his dough with hands in a similar condition. He would say that such a baker was a dirty person, perhaps even use stronger language. Yet bread is subjected to a temperature in the oven high enough to kill the organisms, whilst milk is generally consumed in the raw state.

After the milking of each cow the milker should wash his hands in clean water and dry them; if this is not done bacteria that may be in the liquid on the hands may gain access to the milk in the bucket. It is unnecessary to defend washing on the score that any time expended on it is subsequently made up, for even if the time were actually time lost, its expenditure would still be well worth while. It is contended, however, that any time occupied in washing the hands is made up eventually by reason of the stimulating effect of the water on the hands of the milker. As a shower invigorates a tired body, so does a wash invigorate the milker's tired hands and wrists.

Supposing that fifteen seconds is taken up in washing the milker's hands and the udder in the case of each cow, and that one milker milks sixteen cows at a sitting, this would mean a total loss of about four minutes, but the increased speed of milking would easily make up this time. Moreover, as every dairyman knows, the more actively the milking is done the more the activity of the milk-secreting cells is stimulated, hence more milk of better quality.—A. and P. Notes, N.S.W. Department of Agriculture.

The Milk Yield.

Analysis of statistical data from milk recording societies has disclosed that the milk yield is considerably affected by the length of time that elapses after the cow calves and before she is served, and by the length of the dry period.

Studies of the growth of the udder have shown that it commences at the twentieth week of pregnancy, at which time, if the cow is already in milk, the yield begins to decrease rapidly. Since the udder cannot both produce milk and develop its maximum growth, one or both functions must suffer. Cows which are milked up to the time of calving, accordingly yield much less milk during the next lactation period, a dry interval of forty to sixty days being required in order to produce full growth of udder tissue for the next lactation. The feeding of cows on a milk-producing ration during this period considerably increases the udder growth and consequently the milk yield during the following season.

Variety in the Cow's Ration.

In making up combinations of concentrates and roughages it is as well to remember that there are, unfortunately, very few foods that alone are able to supply a full range of all the essentials, and therefore the most satisfactory rations must, of necessity, include in their make-up a fair variety of foods from different plants. Care should be taken to avoid choosing roughages and concentrates that are derived from "the one stalk," as, for instance, wheaten chaff and bran, corn silage and ground maize meal, green oats and ground oatmeal, &c. The same idea can be extended to cover the undesirability of combining two substances that are deficient in the same essential, such as, for instance, maize meal and bran, both of which are lacking in lime.

The same principles apply in the growing of crops, and explain the remarkably superior results obtained from feeding a crop of oats that has been mixed with a certain percentage of legumes, such as peas, vetches, tares, &c., in order to make up for the deficiencies in the composition of the oats, or, say, a crop of green maize that has been mixed with either soy beans or lucerne to correct the same defect.

The Flax Industry -Little Prospect of Success in Australia.

Because of the large importations of linseed for the production of oil as well as the possibilities of an export trade in fibre, the Department of Agriculture in New South Wales has for many years been conducting experiments in an attempt to establish as an industry the growing of the linseed. Seed of a large number of varieties from all parts of the world where linseed is produced have been imported and tested, experiments being conducted at various experiment farms and in co-operation with many farmers under various conditions of soil and climate, but the results generally have been disappointing.

The probable reasons for the failure of linseed to thrive in this State are the irregularity of the rainfall and the short duration of the spring. The cereals, wheats and oats, are able to withstand dry spells which occur during their period of growth, but linseed appears to be checked by periods of scanty rainfall and by the high temperatures which are frequently experienced during the spring months.

Though the Department is continuing its experiments in an effort to discover means by which the crop can be produced profitably in this State, it does not at present encourage farmers to undertake the commercial cultivation of linseed.

That the experience in New South Wales has been similar to that in the other States of Australia is now evident from a report on the flax industry made available by the Development Branch of the Prime Minister's Department.

In this report it is pointed out that the world's price for flax, expressed in gold currency, is at present close to pre war level and little improvement can be expected. Linen goods are not manufactured in Australia, and the only local market is the limited soft fibre requirements of rope and cordage manufacturers at present met by the importation of Italian hemp.

Experience has shown that climatic conditions render the greater part of Australia's farming territory unsuitable for the production of the crop and that the general quality of Australian fibre can only be ranked as medium to poor.

Unsatisfactory results have attended efforts to grow linseed, and until it can be demonstrated that the crop is profitable, farmers will not be interested in its cultivation.

Estimates of the cost of production of linseed indicate that a yield of 12 bushels per acre, at a price of £14 to £15 per ton would, at the present time, just about provide wages and pay expenses.—A. and P. Notes, N.S.W. Department of Agriculture.

Worms in Horses—Influence of Feed.

There is a totally inaccurate belief in the minds of many farmers that the common worms which infest horses are to be found readily in the mud of dams and creeks, pointed out the District Veterinary Officer to a recent New South Wales Bureau Conference, and the speaker went on to explain that such a belief renders the intelligent control of these parasites quite impossible.

There are many different types of worms which infest the stomach, small and large intestines of the horse, but the methods of propagation of all these worms is very similar. Tens of thousands of the smaller and most harmful species may be present in one animal, and each female of this huge collection lays thousands of eggs. The eggs pass out with the droppings and develop into larvae which are scattered all over the paddock, and it is the swallowing of these microscopical larval forms while grazing which causes the animal to become infested with worms, for the larvae develop to adults in the bowels; and so the process continues to the detriment of the horse population.

Horses do not often contract worms when they are in work, for the reason that they are being well fed and maintain their strength and resistance, and do not have the same opportunity of picking up the worm elements in the paddock. After harvest the horses are turned out for a so-called spell, often on feed which lacks nourishment; they lose their real strength and resistance and being always in the paddocks they pick up quantities of worm larvae and before long they are too weak and wormy to work.

It was suggested by the lecturer that all of this trouble could be avoided by looking after horses well at a lean time of the year when they are not in work. If good feed was not available and it was not possible to change the horses fairly frequently to a fresh paddock (and this was important), then good care should be taken that they receive some hand-feeding. In addition, it was well to learn to recognise when horses were getting "wormy" and see that they were drenched before it was too late.

Spread Manure—A Profitable Practice.

If the cow dung is not harrowed regularly after each grazing, they produce patches of rank growth which are left by stock throughout the entire season, said a lecturer at the recent Illawarra District Agricultural Bureau Conference at Camden (N.S.W.). This condition increases with each successive grazing and results in the loss of a large proportion of valuable grazing area; it may even happen that much of this manure-covered land, if not harrowed, will not be available for years unless ploughed in or removed in some way.

After careful observation it has been calculated that the year's manure from thirty cows contains fertility equal to that found in the following commercial fertilisers:—9 tons sulphate of ammonia, 2½ tons superphosphate, and 4½ tons sulphate of potash. At present prices these would be worth about £200 per year to the farmer, and would represent a very real contribution towards his farm's upkeep.

On the other hand, if the droppings are left unspread, the capacity of the pasture is limited in many respects. The wisdom of using the grass harrow to spread the droppings is therefore very apparent.

An Easily-made Tank Stand.

A suitable stand for a tank can be made by filling a ring of corrugated iron with sand. The ring should, of course, be well riveted, and it is also advisable to further strengthen it by means of hoops of fencing wire twitched up hard against the iron.

The greatest pressure on the floor of the tank will be about its centre, and it is advisable, therefore, to give the sand filling a slight crown at the centre so that the tank, when full, will settle with a level floor. The life of the floor of the tank, and also of the ring of galvanised iron, will be greatly extended if the surfaces coming in contact with the sand are given a wash of cement.

Prosperity and the Hen.

The business people in some of our poultry-farming centres do not always realise what a factor the poultry-farming industry is in the prosperity of their town. Take Parramatta, for instance. Approximately £300,000 worth of eggs and poultry are produced annually within a radius of 10 miles of this town, in addition to which probably £30,000 worth of day-old chicks are sold, and £200,000 is expended on supplies to produce this income. Probably if the townspeople of Parramatta and other business centres in the poultry-farming districts visualised what they owe to the humble hen they would, like the people of Petaluma, California, erect a statute of a hen in the main street.—A. and P. Notes, N.S.W. Dept. Agric.

Lucerne as a Pasture—Why Continuous Grazing is Detrimental.

For normal development a plant must have a certain amount of leaf surface for the conversion into available plant food of the mineral solutions absorbed from the soil by the roots, and because it interferes with this process, heavy continuous grazing is seriously harmful to lucerne. The correct method of handling the paddocks is to wait until the growth is approaching the bud or early flowering stage, and then feed it off rapidly by stocking the area heavily. It is advisable to have reasonably small paddocks, and to put large numbers of sheep on at a time to eat the area off in at least ten or twelve days. If the paddocks are large, temporary fences that can be erected rapidly and moved easily should be utilised for the purpose of subdivision.

In paddocks that are grazed the surface soil sets hard with tramping, and cultivation should be carried out at least twice a year, using springtooth or rigid fine cultivators fitted with special lucerne points. Top-dressings at 1 to 1½ cwt. superphosphate per acre should be made at least every second year. The fertiliser should be applied in July or August, working it in with a cultivator or heavy tripod grass harrow.

Hoven or bloat is likely to occur in sheep and cattle at any time if the animals are hungry when first turned on to the paddock; and the trouble is accentuated if the lucerne is wet with rain or dew. Once sheep become accustomed to feeding regularly on lucerne, however, very few deaths occur. A mixed pasture of grasses and lucerne minimises the danger to a considerable extent, as a variety of feed is available.

Having grass paddocks to which the sheep have access, adjacent to the lucerne areas will result in a better balance of feed than where only lucerne is available. This practice considerably reduces the danger of hoven, and also results in the life of the lucerne plants being extended, as the stock are not feeding on them continuously. It is the young, succulent growths of lucerne which cause most losses from hoven, and whenever possible the feed should be allowed to become more mature and reach the bud or early flowering stage before it is grazed off.—A. and P. Notes, N.S.W. Department of Agriculture.

A Call for Courage—A Message to Modern Youth.

Arthur Mee, whose books and papers have been read by millions while this generation has been growing up, has been looking around the world, seeing Youth everywhere waiting for its opportunity, listening impatiently to its suggestion that it has no chance in these days. This is the message contained in the preface of a new book he has made:

"It is not true that there is no chance for Youth in this twentieth century. There have been dark days before and men have faced them. What Youth needs is not Opportunity but Courage.

This generation has seen millions pass through the fire; it has seen an outburst of heroism unparalleled since Time began. The end of that vast stricken field is the ruin of the world, and everywhere the call is for heroes who will build it up again. The cry is for the courage that will not fail, the spirit that will not quail, the eager brain that sees the boundless chances of this brave new world.

All through the ages there have been such men, such women. If life is hard to-day it was harder a thousand times for them, but they went on. They did incredible things. They made the world we live in."

In his new book Arthur Mee tells us their stories. There is the slave writing the fables every child loves. There is Captain Cook making the British Empire possible, Faraday peeping into electric mysteries, Clerk-Maxwell founding the Wireless Age with nobody believing him, Gurney dreaming of motor cars with everybody mocking him, Hargreaves the Australian making his aeroplane models and scoffed at as a crank. (Because there was no room for Hargreaves's models at Canberra they eventually found a home in a German museum and were regarded as of priceless value to German aeroplane designers before and during the war.) There is Cervantes pulling at a galley oar with Don Quixote rippling in his brain, Grotius locked in his box with the League of Nations in his mind, and many more tales of human achievement against the greatest possible odds in every age, and of men who made our race immortal. "Time is calling again for those who will build a world," and in the great records of our own land, and especially in the lives of Australian pioneers, our youth will find its inspiration. "What Youth needs is not Opportunity but Courage—the courage that will not fail, the spirit that will not quail, the eager brain that sees the boundless chances of this brave new world."

Care of Eggs on the Farm.—Important Points.

Much can be done by the poultry farmer to preserve the quality of eggs going to the market, yet in some instances there is an astonishing carelessness in handling this perishable commodity. One of the first considerations is the nesting arrangements—it is essential that sufficient nests be provided to prevent crowding, which causes breakages and dirty eggs. The nests should be kept clean, as should the houses, so that the number of soiled eggs is reduced to a minimum, because any dirt on the shells, particularly those which are porous, may lead to infection by harmful bacteria, thus causing the eggs to go bad quicker than if they were clean. The trouble would be accentuated if such eggs, while being washed, were allowed to stand soaking for any length of time in dirty water. This should be avoided by placing the eggs in a receptacle with a perforated bottom and immersing them in water for a few seconds, afterwards washing them in clean water.

Where heavy breeds are kept it is essential that broody hens be handled systematically, so that they do not sit on the eggs and thus cause deterioration, particularly if the eggs are fertile—if they were sat on for twelve hours incubation would commence, and, of course, the eggs would quickly go bad. To avoid this risk the best method to adopt is to have portable crates, with slatted bottoms and divided into two or three compartments so that each day's "broodies" can be placed in a separate compartment. It is important that all broody hens be caught each day. This not only helps in keeping up the quality of eggs, but saves loss of production, because by catching the hens as soon as they go broody they will be off the brood again in a few days, whereas if they are allowed to sit for two or three days they will be off laying longer.

Another matter bearing upon the quality of eggs is that of correct feeding. For instance, if green feed is fed to excess in place of more nutritious food, this will lead to watery albumen in the eggs. On the other hand, a too highly concentrated ration will cause a greater percentage of blood spots, which are objectionable in a fresh egg and affect the keeping qualities. Again, a regular supply of suitable shell grit is an essential in ensuring sound shells.

Finally, the method of storing eggs on the farm awaiting despatch to market often leaves much to be desired. The room in which the eggs are kept should be free from mouldy or musty odours, and, while allowing sufficient ventilation, must not be too draughty. The temperature of the room is another important matter, especially in the hot weather, when the eggs should be kept as cool as possible. Where a cool room is not available the best course to take is to pack the previous day's eggs early the next morning, and, after packing, cover the cases over until they are sent to market.

On no account should eggs be allowed to stand exposed to the air during the warm weather, as this leads to rapid evaporation, and results in eggs being rejected as stale.—A. and P. Notes, N.S.W. Department of Agriculture.

Correspondence Course of Instruction in Pig Raising.

This course which has been in operation since the 1st March, 1932, has proved to be one of our most effective means of instructing farmers in the subject of pig raising, and has been the means of interesting many farmers in the improvement of their pig breeding and housing methods. The letters of appreciation frequently received from those receiving the course are very encouraging and indicate that the instruction given appeals to the interested farmer.

Up to the present, 206 students, aged from 14 to 40 years, have commenced the course; 17 of these have completed and 80 are still enrolled; 109 commenced but discontinued the study at various stages of the course. Some of those who have dropped the study have explained that circumstances, such as change of employment and seasonal work, have made it impossible for them to continue. Others give no reason for their discontinuance, and in many cases it is probably due to negligence.

If a student gets a month behind in his work he is sent a circular letter reminding him that he is expected to complete the course; this sometimes has the effect of bring him back to his study.

Although a student receives benefit even if he only pursues a small portion of the course and the time spent on him is not wasted, it is most desirable that when a student enrolls for the course he should complete it within the specified time of one year.

The Hydraulic Ram.

An ample supply of fresh water is often a problem on many dairy farms and, paradoxical though it may seem, this problem is often most acute in districts where the yearly rainfall is heaviest—the rainfall is seasonal and there is rarely any means of conserving supplies for the drier months. It is seldom, however, that running water cannot be found on a dairy farm in the coastal belt, although, admittedly, it is sometimes difficult of access. Furthermore, on the hilly dairying lands much energy is expended by cattle in travelling to and from the water supply. This results in lessened production. How much better to have drinking troughs quite handy and fed regularly with fresh water from these otherwise inaccessible sources by means of a hydraulic ram! The supply thus made available can also be made to supply water for the household and dairy.

When properly installed and adjusted the hydraulic ram will work day and night if necessary without attention; in other words, it is a close approach to perpetual motion. The only essential is a fall or "head" of water. The quantity of water a ram will deliver varies under different conditions, but it may be taken as a general rule that one-seventh part of the water which enters the ram can be raised and discharged four times as high as the "fall" applied. Thus a fall of 10 feet would raise 1 gallon out of every 7 entering the ram 40 feet high, or half a gallon 80 feet high.

Considering the comparative cheapness of a ram and that the cost of operating and upkeep is nil, it is difficult to understand why it is not more generally utilised on farms. The only conclusion that can be come to is that it is not appreciated because it is not understood. Its construction and working are so simple that farmers could not be blamed for regarding with scepticism many of the claims made for this machine. What it will do and the principles on which it works, however, are set out very clearly and briefly in the current issue of the "Agricultural Gazette" of New South Wales.

Cheese a Valuable Food.

It has often been said—indeed, it has become quite a common saying—that cheese is indigestible, and should, therefore, be avoided by anyone subject to digestive troubles. On the contrary, points out a departmental dairy instructor in the N.S.W. "Agricultural Gazette," when cheese of choicest quality is matured, it is in actual fact more digestible than many other foods we eat, and is often specifically recommended by medical authorities, not only for people in normal health, but for those suffering from dietetic troubles. Food analysts tell us that 1 lb. of cheddar cheese contains as much protein as 1½ lb. of sirloin beef and 1¾ lb. of white poultry flesh, and, on the basis of the energy it supplies to the human system, that 1 lb. of cheddar cheese is equal to 2 lb. of sirloin beef or 2¼ lb. of white flesh from the breast of a fowl.

What a difference in energy value there must be then between a meat sandwich and the tasty cheese sandwich, and what an astounding difference it would make in the quantity of cheese consumed every year if only half of the people in this State ate daily the quantity of cheese it takes to make a full sandwich, say, half an oz.

Green Peas—Cultivation on Trellises.

On the New South Wales coast, particularly in the Gosford and Dora Creek districts, the growing of green peas on trellises is a common practice, and is particularly suitable for small growers in these and similar districts. The advantages claimed for this system are many. The yields are increased, picking is rendered easier, less disease is present on the haulms, the rows are more easily cultivated and kept free of weeds, and the plants are not affected so much by continued wet weather.

The method of constructing the trellis is as follows:—Stout stakes 5 feet long are driven 6 inches into the ground at intervals of about 20 feet along the rows. As the peas grow, horizontal wires a little thicker than tie wire are alternately spaced on both sides of the stakes every 6 or 8 inches, or in pairs at the same distance, up to a height of 4 feet 6 inches, according to the growth of the vines. The wires are strained to stout short pegs at each end of the rows. The rows are usually spaced about 4 feet apart. Yields of up to 400 bushels per acre have been obtained by this method, according to reports.

A modification of the method, and one often employed by backyard vegetable growers, is to use sticks and bushes to support the plants.

Fodder a Form of Stock Insurance.

Adequate fodder conservation is merely another term for insurance. Secondary industries have long since recognised the necessity of covering their operations with adequate insurance, and the need of primary industries in this respect is considerably greater.

As to the benefits to be derived from advanced business methods as expressed in the storage of fodder, one has not to go far for examples. In practically every district are to be found producers whose initial step on the ladder of prosperity has been made possible through foresight and good management in having available reserves not only to enable them to obviate losses in their stock but to swell their revenue by availing themselves of the drought fodder prices. Progressive methods, following the lines of crop rotation, lucerne culture, and pasture improvement have materially increased the carrying capacity of the holding. Full use is invariably made of this increased capacity by additions to the farm flock, which in turn involves fodder conservation.

Ample reserves of fodder permit of stocking to the full capacity year in and year out without undue anxiety and risk, and at the same time permit of securing the maximum monetary return. One has not to await recognised droughts to obtain the benefits of fodder reserves. The judicious feeding of sheep during the unfavourable periods which occur every year or two will be amply repaid in the increased return from the wool clip. Droughty stretches of even minor severity invariably leave their mark in the growth of wool, and the assurance of a free, sound, healthy-growing staple yearly will do much towards establishing a reputable and sought-after clip. Further, in the production of fat lambs it is essential that they receive no check whatever if a product of high quality is to be obtained. A ration of crushed oats at a vital time may mean the turning point in favour of a first-class product.

It is merely a recognised business practice to share one's risk per medium of insurance, and for the farmer the most effective means of accomplishing this is to provide adequate forage supplies. By this means he guards against the undue depreciation of his assets, at the same time guaranteeing continuity of production and revenue.—A. and P. Notes, N.S.W. Dept. Agric.

Bush Fire Control.

The strong growth of grass that has followed spring rains in many parts of the State will dry out with the advance of hot summer weather, and unless adequate steps are taken to control outbreaks of bush fires, serious damage to property and losses of stock are likely to be the result. In these difficult times, especially, primary producers should take every possible precaution to ensure that avoidable losses do not occur, and one of the means by which this may be achieved is the immediate formation of efficient fire-fighting units, by means of which it is comparatively easy in many districts (especially open country) to control bush fires.

The value of bush fire brigades has been well proved in many Western localities of New South Wales—for example, the Griffith-Hillston and Parkes districts, where within the past few years several serious fires have been quickly brought under control by fire-fighting units before any great damage was done.

Already this season a number of fires have occurred in the Southern States, thousands of acres of grass having been destroyed in the Jerilderie district and haystacks and even farm buildings in other localities.

Primary producers generally should profit by these experiences and give timely consideration to the formation of efficient fire-fighting units in their districts, and so provide for minimising the damage from bush fires. This is a movement that could well be taken up by branches of the Queensland Producers' Association, which should experience no difficulty in securing both the executive and the personnel.

When fighting bush fires, systematic and capable organisation may be said to be the essentials to success, and for a brigade to attain the peak of efficiency and usefulness it must have, not only the loyalty of every member of the unit, but also the wholehearted support of every section of the local community. Commercial and other interests in rural districts should realise that loss is never individual—it is always felt throughout a community—and that they can effectively assist in the provision of adequate protection from fire losses, not only by direct subscription, but also by the supply of equipment at landed cost.

Scours in Calves.—Various Causes.

Any irritant material eaten by calves is likely to set up inflammatory changes in the stomach and bowels, and thus, where the animals have had access to poisonous substances, or poisonous plants are growing in the paddocks, consideration should be given to these conditions when endeavouring to ascertain the cause of the occurrence of "scours."

Poisons containing arsenic are employed for so many purposes, such as sheep and cattle dipping, weed destruction, &c., that there is a tendency to overlook the poisonous and dangerous nature of the material used, and there is frequently a lack of care in its handling. Arsenical preparations often have a salty flavour and are readily licked by stock.

Certain plants, too, are capable of causing gastritis and enteritis, and when seasons are dry cattle will often eat herbage and shrubs which they would leave untouched at normal times. For instance, bracken fern is commonly eaten in such circumstances and may be responsible for considerable loss. There is therefore necessity for a careful survey of the paddocks where the sickness and mortality are occurring, so that any evidence that plants, usually not eaten, have been taken by cattle, can be observed.

More common and significant types of scours, however, are those due to microbes in the bowel, and to parasites in the bowel.

Zebu Cattle.

The proceedings for 1933 of the American Society of Animal Production contains a paper dealing with the growth of different types of cattle in Louisiana, including crosses with the Brahman (Zebu). The writers state that the Brahman is pre-eminently a grazing animal and makes good gains on coarse grasses. The Brahmans do not appear to suffer to the same extent from flies, mosquitoes, and external and internal parasites. They also stand the heat better. Further, at the Louisiana Station no Brahman grades have died from bloating on clover, while losses among the breeds of British origin are sometimes severe. The authors state that the principal advantage of the Brahman lies in its capacity for making gains on grass alone, a quality that is of great importance on the coastal plains.

Importation of Stud Pigs.

In recent months several valuable stud pigs have been introduced into Queensland from overseas and other States, all with a view to strengthening existing studs and building up foundation stock in the pig industry.

Notable among the importations are the two Berkshire sows recently released from quarantine and now on the property of the owner, Mr. F. Bach, of Oakey. These sows represent the very best it is possible to obtain in the United Kingdom, and, in fact, one sow, Lenton Patience, was a first prize winner at the Royal Agricultural Society Show, Yorkshire, England. She has farrowed her first litter since arrival and is doing well. The younger sow, a full sister to another very prominent prize winner, has been mated to the champion boar at the Farm Home for Boys, Westbrook.

The Queensland Agricultural High School and College secured one of the most attractive Berkshire boars offered at the Melbourne Show sales. This boar, himself a first prize winner, was much sought after and at auction would probably have realised considerably more than the price at which he was obtained.

The College also secured a very fine Berkshire sow and a Large White boar and a pair of specially selected Large White sows.

The most recent introduction is a prize-winning Tamworth sow purchased at the Melbourne Show for the Ascot Vale Stud Piggery, owned by the veteran breeder, Mr. W. S. Hendry, of Clifton. This sow, which had been on loan to the Victorian Department of Agriculture, toured the State on the Better Farming Train, prior to winning first prize at the Melbourne Show. A four months' old boar of her first litter also won first prize in a strong class at the same show. Mr. Hendry intends later on to mate this latest importation with his champion boar, Byron Challenger, the sire of which was champion at the Brisbane Royal National in 1932 and 1933. Although only a little over three years old he has a record of over forty first prizes and championships.

These importations, together with a distribution of stud pigs in the most popular breeds, and the large number that have been distributed through the Better Boar Scheme of the Department of Agriculture and Stock emphasises the importance of the industry and indicates a desire on the part of farmers to improve their breeding stock with a view to providing more intensively for local, interstate, and overseas markets.

Why Pigs Eat Charcoal.

Why do pigs eat cinders, charcoal, burnt corn cobs, and why do they persist in chewing bones? This is because their bodies demand a certain amount of mineral matter and such substances as charcool, burnt corn cores, burnt or charred bones, lime, ashes, all contain necessary mineral nutrients and in order to obtain these the pig satisfies the craving by indulging in the habits referred to. Give the pigs liberal supplies of mineral matters, sterilised bone-meal, and keep them growing and developing to advantage.

Gruel for Calves.

When the young calf is changed over from a diet of whole milk to one of skim milk, some form of concentrate should be added to replace the butter-fat that has been removed in separating. Experience has shown that an excellent addition is a thick gruel made from 3 lb. of crushed linseed and 2 lb. pollard, carefully stirred into 3½ or 4 gallons of water, and slowly boiled for at least half an hour. One pint of this should be added to each gallon of pasteurised skim milk, also one wineglass (2 oz.) of lime-water.

This gruel should be added in small quantities at first, so that the calf may become acquainted with the flavour, also so that its digestive system may adapt itself to a new class of food. If fed in full quantity at first the animal may either refuse the food or will be rather severely scoured by it.

How to Transfer Bees.

The objects of the compulsory use of frame hives are to facilitate the work of apiary inspection and the control and eradication of diseases found in bees. The best time to carry out the process of transferring bees from a box or other imperfect hive to a regulation hive with frames is in the spring during the first honey flow. Brood-rearing is not then in full swing, and combs are not overladen with honey. The danger of robbing is also minimised by the presence of nectar in the fields. The work should be carried out on a sunny day when most of the field bees are out.

First, prepare a standard-sized hive body complete with frames, and standard-size bottom board and cover. All the frames with the exception of one should be wired, and contain sheets (preferably full ones) of comb foundation. Give the bees in the box hive some smoke, and remove the hive from its stand, and substitute for the time being the frame hive minus the one empty frame; this new hive on the old stand will keep the field bees occupied for a while. Next turn the box hive upside down, remove its bottom board, and place an empty box, open side down, over the combs; have a neat fit if possible. Drum the bees up into the empty box by beating on the sides of the box hive with two stout pieces of wood. When completed remove the box now containing the bees and place it temporarily over the frames of the new hive on the old stand.

The combs may now be removed from the box hive. The best pieces of worker brood combs should be cut to fit neatly in the empty frame, and made secure with string fastened right around the top and bottom bars.

Next lift the box of bees from above the frame hive, and place the frame of brood about the centre of the frame hive; replace the cover on the frame hive, and then dump the bees from the box at the entrance of the new hive, and allow them to enter. It is usually best to dump a few first and see that eager entry is sought, and then bump the remainder out. The bees should make a contented start in their new home, having brood for inducement.

An Alternative Method.—After the first box hive has been successfully transferred as described and good headway made in brood rearing, other box hives may be transferred by what is known as the second method of transferring.

Secure a frame of brood (preferably with some larvae), and place it in a new prepared hive fitted with comb foundation. Invert the box hive, place the frame hive minus its bottom board over the combs, and then drum the bees up into the frame hive. When the drumming is completed, the new hive, now containing the bees, is placed on its bottom board on the old stand.

Remove the cover of this new hive and place a queen excluder over the frames; then on top of the excluder fit the old hive to act as a super for the time being. In three weeks a good brood nest should be established in the frames, and all of the brood in the old box above will have emerged, the queen being unable to return to it.

The box may now be removed and the bees drummed out of it into an empty box and then dumped in front of the new hive. The combs can be removed from the box hive and the honey and beeswax made use of. There is no loss practically with this method of transferring.—A. and P. Notes, N.S.W. Dept. Agric.

Is This a Farrowing Record?

Mr. Harry S. Pedlingham, a small farmer residing at Hardwick Farm, Colwall, near Malvern, Worcestershire, England, is the owner of a Large White sow that appears to be the world's most prolific and profitable pig.

On 8th January of this year this remarkable sow produced her nineteenth litter, bringing the total number of pigs that she has farrowed throughout her career to 353. The sow, despite the fact that she is now well over ten years of age is still in healthy breeding condition, and Mr. Pedlingham's ambition is to achieve a figure that will irrevocably establish the record for prolificacy for Great Britain for all time. Her owner expresses the conviction that 400 pigs would be quite a moderate estimate of the sow's breeding possibilities.

An outstanding feature of her breeding career is the fact that a litter well above the average number has been farrowed with the regularity of clockwork each and every six months since 12th December, 1923, when the sow commenced its record-breaking career at just under twelve months of age.

A further remarkable feature was the farrowing of three litters with a total of sixty-five pigs in the year 1930, and it is worthy of note that seven litters of twenty and over have been produced. Mr. Pedlingham attributes the large and consistent farrowings chiefly to contentment engendered by regularity of habits and feeding. The importance of weaning such large numbers and minimum of time to permit of a further farrowing in as short a period as possible was not overlooked. To achieve this later object correct and regular feeding was essential. Only first-class boars have been used. That the pigs were of good quality is substantiated by weight of age records. At nine weeks of age eight pigs from one litter were weighed and tallied as follows:—

Eight pigs weighing 50, 48½, 49, 49½, 48, 50½, 47, and 42. These pigs averaged 34 lb. at seven weeks of age—a good average indeed. To illustrate that the prolific characteristics of this sow have been passed on to the offspring, it is worthy of note that a sow farrowed in one of the litters of twenty-one born on 19th July, 1929, has already broken its dam's record over a given period. Another has so far made an average of sixteen to a litter and a boar that is now just over twelve months of age has achieved sixteen pigs in his first litter. The majority of the sow's offspring which have been disposed of for breeding purposes show the same gratifying results. The full details of the sow's farrowings up to 9th January, 1933, are shown below:—

Date.	Year.	No.	Date.	Year.	No.
2 December .. .	1923	12	19 July	1929	21
15 June	1924	24	1 January	1930	24
28 December . ..	1924	18	13 July . ..	1930	21
11 June	1925	15	29 December .	1930	20
25 December ..	1925	19	30 June	1931	16
24 June .. .	1926	18	4 January . ..	1932	14
2 January ..	1927	16	2 July	1932	18
3 July	1927	19	3 January . ..	1933	16
5 January . .	1928	19			
29 June	1928	22	Total, 19 Litters		353
4 January .	1929	21			

The Late Dr. Bancroft.

Dr. Thomas Lane Bancroft, who died recently at Wallaville, near Bundaberg, was the famous son of a famous father, whose memory is commemorated in scientific circles in Brisbane by the annual Bancroft lecture. Dr. Bancroft, the senior, may be regarded as the pioneer in Australia of medical research directed towards advancing the white settlement of our tropics. He came to Brisbane as a young English doctor, settled here, and gained an international reputation for his scientific work, particularly for his investigations into the cause of filariasis. Sir Ronald Ross, the later discoverer of the way in which malaria is spread by mosquitoes, acknowledged a heavy debt to the elder Bancroft. Dr. T. L. Bancroft carried on the work of his father after the latter's death in 1894, and his subsequent intensive study of the ceratodus furnished contributions to knowledge that were highly valued in the international world of science. Men such as he receive much less honour from their fellow citizens than a popular cricketer or footballer, but the honour they confer on the State will outlast most sporting laurels.—"The Queenslander."

Thought, Its Power, and how we fall down on the Job.

Following is an excerpt from a striking editorial in a recent issue of "The Producers' Review" (Toowoomba, Q.):—

With reluctance we have been forced to the conclusion that human nature readily finds a groove which shackles it to the ordinary every-day task of earning a living. The tragedy of many potentially able minds is that routine work and routine thinking become almost automatic, until the ability to think along original lines is destroyed, in the same way as a limb becomes atrophied if it is not in use. To-morrow will not bring anyone greater power and authority unless these are being stored to-day.

How can men acquire the ability and the habit to think freshly, critically, and dispassionately on problems which confront humanity? Perhaps the starting point is in a recognition that the ordinary daily task is but a repetition of habits and thought applied until it can be performed as easily as rolling off a log, and a realisation of that fact will show that in its doing there is no real advancement or development of faculties.

The next stage of effort is in the determination to do some concentrated thinking on problems other than the day's work. This can be done by applying the advice of a great thinker, who once said:—

"I believe in working on second wind. If a man is satisfied with just three meals a day and a roof over his head, perhaps he can manage to satisfy his wants by an ordinary day's work. But if he wants to store up reserve meals and shelter against the coming years, or build something worth while, he will have to learn to use his second wind. At the end of an ordinary day's work you feel fatigued. Pressing on further may seem difficult, even impossible. But if you will make this second start—draw on your second wind—you will soon uncover new layers of energy. Fresh supplies of working force come to your aid. Moreover, after a time, you can accommodate yourself to that additional effort, and not mind it. When this second supply is exhausted, you can uncover still another layer of energy."

All of us are potentially amenable to development. The men who achieve important positions in life depend less on their natural aptitudes or inherited gifts than on the acquired ability to fix attention upon a specific problem and to hold the mind to that problem until they have seen it through. The man who gets somewhere has to learn to make his mind behave in the direction which it ought to take in order that he can persist in affairs that are vital to him and to others, no matter what drudgery is involved. The starting point in thinking deeply on matters away from the obvious is in deciding to give, at regular intervals, a few hours' concentrated attention on some special subject. The focusing of our minds intently on some predetermined goal or problem is a knack that can be acquired once a person has got hold of the idea. Carlyle said that "the weakest living creature, by concentrating his powers on a single objective, can accomplish something; whereas the strongest may fail to accomplish anything."

There is no recipe for thinking, no mental tabloids producing thought as opium produces visions. But there is a hygiene of the mind resulting in thought as inevitably as bodily hygiene results in health. At all times in the past thinking has been helped by a disgust for the trivial, a retirement from nonsense, and by commerce with superior intellects. At no period in the future will it be helped by different methods. A long process? No, the least investment is productive at once. An exacting one? No, distinction is far more enjoyable than commonness. Only try.

Is the effort worth while of doing some thinking away from the commonplace? People know that they ought to do a great deal better than they pretend to do. Granted a sound body, with normal sense organs, men can and should develop in accordance with their general intelligence, and this can be done through long practice in doggedly doing, along with that which is agreeable, a lot of things that are tiresome and monotonous, going out of our way, if necessary, to find them.

It is the moments when one gives up and goes down on the job that make the difference. Without doubt there is a great deal of habit in what we do—the habit of floating along or the habit of resisting. No one can live out a normal life without coming to moments that are very important, moments when it is going to make a lot of difference whether one hits with all he has or lets it slide. In a critical moment we have to decide whether to get drunk, whether to push for a better job, whether to tell a hard truth or an easy lie, whether to do something requiring great effort. The details may vary endlessly; but it is the same punch that takes us through. Having the habit of it will make it come easier. Most people become so much creatures of their habits that they are afraid to stir beyond them.

Farm Blacksmithing.

In setting up a blacksmith's shop on the farm an endeavour should be made to secure the best and most convenient position away from other outbuildings. Old iron and timber can be used for the walls, but a good roof should be erected, because tools which will be of great value will be kept in the shop.

In fitting out the shop there are some tools absolutely necessary, and continually being used, whereas others are called on only occasionally. The anvil and blower, vice, drilling machine, stocks and dies, hacksaws and punches are of great assistance in repairing the various machines and implements.

Most of these are frequently offered at sales, and usually can be purchased at a reasonable figure. To be fully equipped as a repair shop, the bush carpenter's shop should be amalgamated with that of the blacksmith. The majority of machines contain a proportion of woodwork, and it is useless to commence to overhaul without having a few of the most commonly used carpenter's tools close at hand.

An assortment of nuts, bolts, washers, &c., within reach, is also of great benefit. One should not attempt to repair a machine, knowing that the necessary bolts or the equivalent in the making are not on the spot.

Although only a few in number, one is amply repaid by having them handy and labour saved will more than account for the interest.

Unless the farmer has had a good deal of experience, no attempt should be made to do large and heavy jobs, or work that requires accurate setting. In the latter case the job might appear quite all right, but when set in position it will be found to have a decided wobble, consequently worn bearings will follow. Repairs such as those just outlined should go to the tradesman.

Apart from machinery and implements to be repaired, there are numerous other things that come quite within the province of the amateur. Of these, plough chains, if used, are one of the most important items to be kept in good order. Not only is it much better to have them minus so much wire, but by keeping them evenly repaired much will be done to minimise the risk of sore shoulders.—"The New Zealand Farmer."

Bureaucracy.

Mr. J. Pearce Luke, President of the Wellington (N.Z.) Chamber of Commerce, in his address at its annual meeting, surveyed the world position, and pointed out that the records of history show that in a general upward movement there have been periods of retrogression. Invariably these periods have developed nobler traits by reason of the discipline inseparable from the experiences of "hard times." . . . A war embittering the contending nations; a peace pact imposing such conditions that the principal contestants have been in economic thrall ever since, and over and above it all the merciless threat of bureaucracy. Bureaucracy has determined the bounds of national development, and unless and until it is swept away there cannot be real national or international progress."

Tomatoes—Picking and Packing Points.

Care should be taken when gathering tomatoes that they are not bruised, or they will decay rapidly. Tomatoes that are to travel long distances, or occupy days in transit, should be picked when they begin to colour at the blossom end, or even when they take on a light green colour.

When packing, the fruit should be graded according to size and ripeness, all in each package being as nearly alike as possible; the grading regulations in force provide for a variation of not more than 1 inch in the diameter of the fruits in any case.

The fruit will thus look better, sell better, keep better, and pack or travel better; the arrangement will be found advantageous to the buyer and more profitable to the seller, besides establishing a reputation for the brand amongst buyers. Each package must have the contents and quality faithfully marked on the outside, so that buyers may learn to rely on the brands without wanting to overhaul the fruit.

Culls should not be marketed, but fed to pigs or destroyed, as is done with other refuse fruit.

Seasonal Points in Poultry Management.

During the summer there are many factors which tend to make a difference in the returns from a poultry farm, and a great deal depends upon the efficiency of management as to whether egg production is satisfactory or not.

As far as the layers are concerned, close attention to feeding is necessary to ensure a seasonable continuity of production; faulty feeding methods are the reason why many poultry-farmers fail to secure the egg production they should during the summer and autumn. It will be found that during a hot spell the birds do not require as much food as usual, and unless judgment is exercised in feeding there is likely to be a sharp decline in the egg yield, due to the hens becoming surfeited with food, resulting in digestive derangement.

The wisest course to follow when a heat wave is expected is to reduce the usual quantity of food in accordance with the appetites of the birds, so that no food is allowed to lie around throughout the day. In fact, it is preferable to keep the birds rather keen for their meals, and when a cool change comes, gradually to increase to the normal quantity.

Strict attention should be paid to the watering arrangements to ensure that fresh water is provided and kept as cool as possible. Also that the water vessels are placed in close proximity to the houses; the birds should not have to traverse long distances during the heat of the day to obtain water, as this often leads to high mortality. Where automatic watering systems are fitted, care should be exercised to see that the vessels are kept clean and free from contamination by mash or other organic matter which may cause fermentation; this applies particularly where dry mash is fed.

On many poultry farms insufficient ventilation is provided during the summer time. It is quite common to see houses for both young stock and adult birds without an aperture along the top of the back wall under the roof to provide ventilation. This is due to the erroneous idea that an open-fronted house is sufficiently ventilated, but it should be understood that unless a current of air can pass through a house there will not be free circulation of the air. Moreover, by having a fair-sized aperture under the roof much of the heat reflected by the roof is carried off. The deeper the house, the larger the aperture required; it is a wise plan to have an adjustable shutter to open in the summer time and close in the winter.

Lack of ventilation is one of the causes contributing to an outbreak of catarrh (or "roup") among young stock, particularly towards the end of the summer when the humidity is high.—A. and P. Notes, N.S.W. Dept. Agric.

Grazing Lucerne.

Grazing lucerne with the dairy herd has one advantage and two drawbacks, when compared with the plan of cutting the crop and carting it to the cow pastures. The advantage lies in the saving of labour, and, when a considerable area has to be handled, this is an item of considerable importance. On comparatively small farms, where the owner and his family do most of the work, cutting and carting the lucerne is undoubtedly the most economical plan.

The drawbacks to grazing are the shortening of the life of the stand and the necessity of more cultivation with the object of keeping down weeds, which take possession more quickly when the lucerne is grazed than when it is constantly cut, and there is the risk of loss from bloating. When the lucerne is cut there is no waste of material, but when grazed there is considerable waste through the trampling of the cows.

Whether the lucerne is grazed or cut, the land must be thoroughly cultivated at least once each season, in order to keep down weeds and stimulate the growth of the lucerne plants; but, as previously stated, more cultivation is required when the crop is grazed than when it is cut, for the reason that, in the former case, the weeds are rejected by the cows, and have an opportunity of spreading; while, in the latter case, lucerne and weeds are both cut down regularly and removed to the pasture before they have time to ripen their seeds.

It is considered a mistake to graze the first growth of the young lucerne, but I see no reason why the cows should not be turned in to pick up the cut material, provided they are not allowed to stay too long and injure the young shoots of the second growth. When lucerne is cut and carted to the pastures, it should be cut to-day and carted to-morrow.—Primrose McConnell in "The New Zealand Farmer."

Pasture Improvement Increases Production.

If any further evidence were required of the value of pasture improvement on coastal dairy farms it was provided by the past season's production figures at Berry Experiment Farm (N.S.W.). The total production was 8,910 lb. milk testing 4.22 per cent., averaging 376 lb. butter-fat per cow for the year ended 30th June last. Compare these figures with those for the year ended 30th June, 1927, before pasture improvement work was undertaken seriously. In that year total production was 7,562 lb. milk of 3.6 per cent. test, average 272 lb. butter-fat per cow.

It is of more than passing interest to know that last year's production figures include those of many heifers which are the progeny of the first animals reared on the treated pastures at Berry Farm, and which show a notable improvement in both appearance and production.

The Holstein as a Milk Producer.

Weight in Holstein dairy cows should not be mistaken for beef type, writes Dr. H. Epstein, D.Agr., a South African authority. No Holstein breeder wants beef, but he wants heavy, large framed animals. He wants these, not because they carry large quantities of flesh, but because they are the biggest and most economical milk producers.

One of the world's biggest Holstein cattle breeders' associations has compared the records of a large number of its highest producers to their body weights with the following result:—

Average Live Weight Per Cow.	Average Milk Production.
Over 1,540 lb.	20,880 lb.
1,430 1,540 lb.	19,745 lb.
1,320 1,430 lb.	20,024 lb.
Under 1,320 lb.	17,668 lb.

The heavier cows have proved superior to the lighter ones as far as milk production is concerned, a fact which has been experienced in the United States as well.

But the heavier cow also needs less feeding for a certain amount of milk, a point which should be of the greatest interest to dairymen. One hundred pounds weight of starch equivalent enabled cows of—

Over 1,540 lb. to produce 202.4 lb. milk.
1,430 1,540 lb. to produce 204.3 lb. milk.
1,320 1,430 lb. to produce 200.9 lb. milk.
Under 1,320 lb. to produce 177.6 lb. milk.

Holsteins of the heavy type are, according to these extensive tests, not only the biggest, but also the most economical producers. In other words, the light, fine, old-fashioned dairy type in Holsteins is uneconomical in comparison with the heavy, strong, broad and deep set modern dairy type.

To Protect Haystacks against Mice.

Many devices have come under notice from time to cope with the mice pest in relation to haystacks, observes a departmental publication. Building the stack upon a raised platform answers the purpose, if the blocks upon which the platform is built are capped with galvanised iron guards or inverted petrol tins so as to prevent the mice reaching the platform boards. Another successful method of keeping them out is to enclose the stack with a fence of galvanised iron, either plain or corrugated, about 2 feet high. Let the iron into the ground to a depth of 4 inches, and place it in a slanting position, leaning outwards, all round the stack; take care to leave no open space at the corners. To ensure that mice do not enter a stack thus protected, care should be taken that straws, bags, or other articles are not allowed to hang from the iron fence or from the raised platform.

If it should be found that mice are troublesome in the stack, poison with arsenic dissolved in water. Place dishes of the solution all round the stack; if it will not entirely eradicate the pest, this method will help to keep it in check.

Proper precautions should, of course, be taken in using the above, as in the case of any other poison.—Ag. and P. Notes, N.S.W. Dept. Agric.

How long to Milk a Cow.

The number of cows which can be milked in an hour is a problem which appears to have puzzled people of all classes except those who have actually milked cows, to whom the matter is so simple.

The factors which control the number of cows which can be milked per hour are many and varied. The time of the year, the amount of milk produced, the ease or otherwise with which the milk can be drawn, and, of course, the skill of the milker vitally affect the situation. In the month of May, when in Cheshire and Shropshire the cows go out to grass, with probably a percentage of first calf heifers with short teats among them, a very general number of cows for each milker is eight.

With average cows you have to slip along to get these milked and dripped within the hour, but it can generally be done when there is a fête or some other attraction ahead. Exceptionally good milkers could possibly milk twelve such cows in the hour, but it would hardly be a matter of ease.

There are short-teated heifers sometimes which would take up to fifteen minutes for the best of milkers to milk out clean, and there are nice easy cows from which a bucketful can be extracted in four or five minutes.

As the year advances and the cows drop off their milk, the number which can be milked in the hour naturally increases, and later on it would be no hardship or difficulty to milk fourteen in the hour.

With regard to the question, Is quick milking always thorough milking? Unfortunately, it is not. When it is thorough and clean, quick milking undoubtedly obtains the best results.—A. J. Lee in the "Livestock Journal" (England).

Pigs and Pork—What the Market Demands.

Mr. Charles Binnie, president of the Stockowners' Association of New South Wales, during his recent visit to England, made close inquiry into the pork and bacon trade of the United Kingdom, and has supplied us with some particulars which again confirm the conflicting requirements of the local and English markets as regards bacon. Mr. Binnie noticed in the retail shops that the "streaky" bacon that is generally fancied in Australia was the cheapest, being priced at about 9d. per lb., whereas the heavily fatted cuts from the gammon and back were most in demand, and ranged in price up to 14d. per lb. Bacon or pork from Tamworth pigs was not favoured, that from the Large White being most sought after by the trade.

The differing tastes of the two countries is accountable for to a great degree by their dissimilar climatic conditions, the colder English climate favouring the consumption of comparatively fat bacon. Under the circumstances, it would appear that to meet the demands of both the overseas and local markets the pig breeder in this country would have to raise two distinct types of baconers. At any rate, the Australian trade is at present well served by the Tamworth-Berkshire cross, bred back to the Berkshire or Tamworth.

The issues in connection with the pork export trade are not so confusing, although, as Mr. Binnie points out, the carcass most favoured is one between 70 and 80 lb. Maize-fed pork is not favoured in England, the fat being considered "tallowy." Pork from pigs fed on peas, beans, barley, or wheat, however, is quite acceptable to the trade. Mr. Binnie draws particular attention to the potentialities of wheat feeding for pork production, and suggests that pig breeding and fattening might, with profit, develop into more than a sideline with wheatgrowers, who, he claims, could get a return of 5s. a bushel for their wheat by marketing it "through" the pig.—"Agricultural Gazette" of New South Wales.

Maize Cultivation.

Harrowing the young maize crop is a very efficient means of killing young weeds, conserving moisture, and aerating and warming the soil to give the young plants a quick start. Deep cultivation may be practised in the early stages of growth, but as the roots spread shallow cultivation should be practised.

Where weeds cannot be controlled by other cultural operations, hilling may be necessary to check and smother weed growth. Hilling as a practice in cultivation cannot be recommended. Hilling with the plough is not generally advisable owing to the unavoidable destruction of roots, which gives the crop a setback.

The main object of all cultivation should be to keep down weeds.

White Hide—The Alum Tanning Process.

The following directions for the making of white hide are given by the lecturer in charge, Sydney Technical College Tanning School, in the "Agricultural Gazette" of New South Wales.

1. Soak the hide in clean water for four hours, then run off the dirty water and cover with clean water; leave for twenty-four hours. This should be sufficient for fresh or salted hides. Dry hides should be soaked for a further twenty-four hours, or until they are soft.

2. Remove the hair by soaking hides in milk of lime—30 lb. of lime per 100 gallons of water. Handle each day, and leave until the hair can be removed—about six to seven days in summer.

3. Remove all flesh and fat by scraping with a knife. Wash well with several lots of water during the twenty-four hours after removing the hair and pieces of flesh, fat, &c.

4. Tan in a solution of alum (5 lb.), salt (1½ lb.), Glauber salt (1½ lb.), and water (10 gallons). Use enough of the solution to cover the hides. Handle twice daily, and allow six days for tanning.

5. Drain well from the alum and salt solution, but do not wash; then cover both sides with fish oil or neatsfoot oil and hang up and allow to dry slowly. Tanners have a machine for forcing the oil fats, &c., into the hide.

6. When dry, stretch until soft. If dry skins are difficult to stretch, sprinkle with water and cover for two days; again stretch and dry.

Alum tanned leather is sometimes covered with a paste instead of oil before drying. The paste is made up as follows:—

5 lb. flour,
2½ lb. alum,
1 lb. salt,
1 lb. neatsfoot oil,
1 to 1½ gallons water.

Mix the alum and salt with water and then the flour and oil in a separate basin. Add to the flour and oil sufficient of the alum and salt solution to make a paste. Put the hide and paste into a tub, and handle the hide vigorously so as to force the paste into the leather. Hang the leather up and allow it to dry slowly without removing the paste. If the leather is too firm, rub on more fat, such as soft dripping, &c. If possible, stretch the leather just before it is quite dry. After stretching, it can be nailed on a wall or similar surface.

Bees and Fruit—A Profitable Combination.

Heavy losses are sustained annually by fruit growers as a result of their trees not bearing well, which in many cases is due to defective pollination of the flowers of the trees, runs an article in the "Agricultural Gazette" of New South Wales. Investigations have shown that insects play an important role in the pollination of flowers, and in this regard there is none more industrious than the honey bee. If it were possible for human hands to do what the bee does, it is safe to predict that the owner of those hands would commercialise his ability and command a substantial wage. That the bee does it for nothing and is therefore neglected only goes to prove the old saying that what you get for nothing is often valued at cost price.

Of all the insects that visit flowers the highest frequency belongs to bees, though there are other insects, such as the Syphrid flies, small beetles, &c., that assist in the transference of pollen from one flower to another. The bee is, however, the best equipped for this function. Inside the flower, nectar is secreted, and this attracts the insect, which, while crawling about within the flower in search of the nectar, accumulates pollen on its hairy body, and when it settles on another flower some of the pollen is bound to adhere to the sticky pistil of that flower. It has been shown that by placing a beehive in an orchard during the flowering season it is possible to enhance the fruit crop, even though the orchard may be in a fruit area famed for the production of good crops in normal seasons, and it has also been shown that the trees nearest to the hive bear the best crops.

The distance the pollen can be carried and the number of flights made by each bee will depend on weather conditions and the size of the swarm. On warm, sunny days the bees are more active than during cold or cloudy weather.

Experiments in other countries and experience in this country have shown that even with cold weather during the flowering season the trees nearest the hives bear better than those farther away. Thus, the greatest distance to which "suitable" pollen can be carried from its source to the trees to be fertilised is determined by the nature of the seasons. "Suitable" pollen is that which will produce good results after pollination. For example, the pollen of certain tree varieties will only be suitable for certain other varieties, e.g., certain apple varieties for other apples, as is also the case with pears, plums, strawberries, and almonds.

Discussing this subject, a South African authority recommends that bees be kept at the rate of one strong colony, or, where possible, two colonies to the morgen (about two-thirds of an acre). The hives should be moved about in the orchard during the flowering season, and removed thereafter.

QUEENSLAND RECORD IN BACON PIG SLAUGHTER.

To have slaughtered more than a million bacon pigs and to have supervised the slaughter of several millions more, is the record of Mr. Sam Mison, the veteran foreman of J. C. Hutton's bacon factory at Zillmere. It is certainly a Queensland record, and may be a world record.

Born in Gibralter in 1869, Mr. Mison landed in Queensland with his parents some six years later. His parents were among the first settlers at Lutwyche where, for many years, his father was engaged in brickmaking. Sam's first job was carting bricks to the Brisbane Grammar Schools and Boggo Road Gaol. Always interested in pigs, Sam's first outside experience in slaughtering was at the co-operative slaughter yards at the Grange, then known as Mooney's yards. While thus engaged, this energetic youth attracted the attention of J. C. Hutton's, who were then located in the Valley, and Sam's job was washing bacon and hams in the process of curing.

There were few pigs bred in Queensland for the bacon trade in those early days, most of the supply coming from Melbourne and New Zealand. The late Mr. John Reid, for half a century prominent in the Queensland bacon trade, just about that time located the site at Zillmere where the factory still stands and purchased the property from Mr. John Lees. This was about 1889, and shortly afterwards Sam was engaged as slaughterman, and carried on this work for two years or more. He felt he would like to see more of the world, so resigned and moved north as far as Burketown, where as a brickmaker he prepared bricks for a large boiling-down works at that centre. Thence he returned to Brisbane and was engaged by the Hollandier Meat Company, owned by Mr. William Dobbyn.

A breakdown in the machinery threw Sam on the labour market until the keen-eyed John Reid again secured his services in March, 1894, and from that day to this Sam has been in the employ of the old firm.

In those days, of course, the method of treating pigs was different to the modern method now in use, and a man would kill a number of pigs, pass them on to the scalding tank, and help with the cleaning and dressing, which was all done by hand, and would take a full day to get through the number the dehairing machine now does in an hour.

It was while thus engaged in later years with the machines that Mr. Reid remarked to Mison that he thought he should be ashamed to look a pig in the face, seeing that on that day he had slaughtered his millionth pig.

For over twenty-five years Sam slaughtered between 60,000 and 70,000 pigs per annum. After the death of Mr. Frank Weston in 1915, who was then foreman of the works, he was appointed to that position and has held the important post until now. Sam well remembers the days when the farmers from the Dayboro and surrounding district would leave home the night before pig slaughter day with their German wagons to cart their pigs to Zillmere. They are now delivered by train and motor lorry.

Sam still carries on the good work and has a wide circle of friends in the business and social world of the district in which he resides, and is ever willing to lend a helping hand in any movement aiming at progress and improvement of the conditions of the man on the land.

—E. J. SHELTON, Senior Instructor in Pig Raising.

PLATE 23.
Entrance to Gorge, Carnarvon Range, Queensland. Note the peculiar rock formation on the right suggestive of a rugged human face.

PLATE 24.
Looking up Mooleyamba Creek from the first crossing, Carnarvon Range, Queensland.
[*Photos.: J. L. Bowman, Dept. Agriculture and Stock, Brisbane.*

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable cases of infant mortality.

HOLIDAY TRAVELLING.

TRAVELLING with a baby and several small children is no holiday for their mother. Unless she plans everything carefully beforehand a long train journey may end with an exhausted mother and a handful of cross, tired, over-fed children, who will be sick for the next few days. Perhaps a little advice at this season of the year may be helpful.

Food.

It is most important that this should be carefully considered beforehand. The breast-fed baby, who has been properly managed should give no trouble at all. But it is not so with the bottle-fed infant. We have seen many who have been seriously upset by milk which has gone bad in the train, especially in hot weather. It is true that there are ways of carrying the baby's milk safely. But these require so much care and understanding, and the consequences of any mistake may be so serious, that we cannot advise them. Nor can we advise the mother on a journey to buy milk at the railway stations. Much the safest plan is to carry a supply of good dried milk (Glaxo or Lactogen) not, of course, dried skimmed milk. Boiling water is always procurable, and it may also be carried in vacuum flasks, so that it is always possible to scald the bottles and teats, and to make up the feeds for each meal. Any milk left after a feed should be thrown out at once, never left in the bottle. It is well to carry more than one bottle and teat. These should be wrapped in clean boiled butter muslin and carefully packed in a tin. Though the baby may not be used to dried milk, it will do him no harm, provided it is not made too strong. It will be wise to make it up rather weaker than advised on the tin. At the end of the journey, when good fresh milk is procurable, he will soon make up for having been on a rather weak mixture for one or two days.

For the toddlers avoid bought foods, cakes, and sweets, which may do him much harm, especially as the novelty and excitement will very probably have weakened his digestion. Remember that a day of rather short rations will do him no harm, but a day of over-feeding may go a long way to spoil his holiday and your own too. Carry your own provisions. Pack a tin with some slices of baked bread and oatcake, which may be ready buttered, and some sandwiches, preferably of brown bread. These may contain lettuce, sliced tomatoes, egg, either sliced or scrambled, or soft cheese spread on butter, or marmite. Add a few dates and raisins, apples, and oranges, and you have all the solid food necessary. He may drink dried milk dissolved in hot water, like his baby brother, or you may carry one or two lemons with a small packet of sugar, which will make a drink he will surely relish. Let him have his little picnics at the right times, but don't try to keep him quiet by feeding him all the time. You won't succeed, it will only make him cross and irritable, miserable himself, and a torment to others. But let him have a drink of water when he wants it.

Amusement.

Most children will be interested in looking out of the window until they are tired, but don't let them tumble out. It may be well to carry a few simple toys and picture books and writing pad and a pencil.

Clothing.

You won't need to carry much wraps in the summer, but a light rug and cushion will be useful. For the baby have a plentiful supply of napkins, and some old newspapers or a mackintosh bag for the wet napkins.

Rest and Sleep.

These are important if over-fatigue and fretfulness are to be avoided. A dress-basket is most useful for a young baby. Properly managed he will sleep or lie awake in this quite contented, and much happier than if constantly nursed in the arms of an over-heated and exhausted mother.

If you have trained your children well you will reap your reward when travelling. How sad it is to see children in the train scrambling over everything, eating an endless supply of cakes and sweets, grubby and tired, ignoring their mother's efforts at control, and finally fretful and crying from sheer exhaustion and discomfort.

COUNTRY WOMEN'S CLUB WORK.

Writing in the Agricultural Bureau Record (New South Wales), Miss Lorna Byrne, B.Sc.Agr., Assistant Organiser of Women's Branches of the Bureau, makes the following useful suggestions for country women's organisations:—

DURING the past year a considerable number of branches have formed special women's committees, which are apparently functioning with much success. Other branches are considering this activity, but some of them still seem to be somewhat in doubt as to how the work of the women in this direction might be carried out.

There are already several women's clubs and they are doing excellent work, but there is sometimes a tendency, when a club is formed, for it to become almost a separate women's organisation. Should this occur it would be very undesirable, as there is already one important women's organisation—the Country Women's Association—which is doing wonderful work amongst the women of the State, and it would be regrettable if we created any overlapping.

The ideal branch is the one which arranges that the men and women shall meet together on the majority of occasions for talks, demonstrations, debates, and social activities which are of common interest, but there are obviously occasions on which the subjects of most interest to the men would be of little concern to the majority of the women in the branch. It is then desirable that the women's committee should take charge of the women present at that particular meeting.

I have often been asked, "What can we do at such a women's meeting?" I would like to suggest that the knowledge of the women in the district should be organised through this committee and made available to other women members. It is a very good plan to make a list of the women members and then to ask the question, "Who does what well?" It is quite easy then to find the women who are most qualified to deal with certain topics of interest. For instance, one woman is probably more expert than some of the others in the art of flower gardening. It would be very useful then, if on one occasion, she would take the women members through her garden and discuss with them the methods of preparation of the beds, the propagation of plants and the conservation of moisture in the soil. Another woman probably has had experience in dressmaking and millinery and a "renovation afternoon" might well be recommended under her guidance. Sometimes again, a demonstration in the kitchen by a member on preserving of fruits, making of pulp, uses of dried fruits, sweet-making, cake decorating, and allied subjects would be found very helpful to a number of the members. So one could go on enumerating the very many topics of direct concern to the majority of the members of women's sections, which could effectively be discussed, by individuals who have either, through longer experience, or more expert training, gained more information on certain subjects than other women have been able to do.

Apart from household matters, one might suggest that doctors, dentists, nurses, and officials of the Railway and Health Departments, as well as ambulance officers might well be invited to visit the branches and discuss such matters as health, home-nursing, care and development of the teeth and first aid. Already numbers

of addresses and demonstrations have been given by the courtesy of these professional people, and they have proved invaluable in spreading the propaganda of good health among many of our members.

In regard to first aid, some of the branches have been a little inclined to shun such a topic, thinking that it would be necessary for members to carry out a full course, and this, I consider, would be rather difficult for the majority of our Bureau branches. At the same time a knowledge of what to do in case of accident—for example, a knowledge of the arresting of bleeding, the making of an improvised stretcher, the temporary setting of a broken bone, the treatment of snake-bite and antidotes for poisons—is absolutely necessary for the majority of people who live in the country, so that talks and demonstrations on these matters can well be recommended, even though a full course with the necessary examination for a first aid certificate may not be practicable. I would like to suggest also that every branch should endeavour to include in its library a first-aid handbook.

CITRUS FRUITS IN THE KITCHEN.

Orange Delight.—Peel and remove the pith of six oranges. Slice thinly in rings, removing the seeds. Arrange in a glass dish or a pyrex, and sprinkle with sugar. Pour a rich boiled custard over the top. Make a meringue with the whites of eggs and head it on top of custard, then garnish with grated orange peel. Set meringue in oven; stand the glass in pan of water while in the oven.

Orange Quarters.—Take three oranges, ½ teaspoon citric acid or juice of two lemons, 2 cups hot water, 1 tablespoon brandy or sherry, little cochineal, and 3 dessertspoons gelatine. Cut oranges in halves, scoop out centre, leaving only the skins; do not break them. Dissolve gelatine, sugar in hot water, add acid or lemon juice, sherry or brandy, and colour half the mixture with a few drops of cochineal. When cool pour mixture into shells or skins, and allow to set. Serve on a bed of green leaves.

Orange Compote.—Take ½ pint of water, ¼ lb. sugar, and six oranges. Peel oranges, divide into sections, boil sugar and water with shreads of orange peel. Take out the peel and put the orange sections in the syrup and simmer gently ten minutes. Take out and arrange in a glass dish. Add a couple of sheets of gelatine dissolved in water to the syrup and allow syrup to cool a little; then pour over the oranges.

Lemon Trifle.—Items required are 3 cups water, 1½ cups sugar, juice and rind of two lemons, 2 tablespoons arrowroot, and whites of two eggs. Boil the water, sugar, and lemon juice together, then add the blended arrowroot, and when cooked add the stiffly-beaten whites. Serve cold with custard made from yolks.

Orange or Lemon Shape.—Take 3 eggs, ½ oz. gelatine, 2 oz. sugar, cup of hot water, rind of a lemon grated, and juices 2 oranges or lemons. Soak gelatine in hot water, whip whites of eggs till stiff; gradually pour on gelatine and water, beating all the time, beat yolks and add sugar, beat all together. Pour into a wet mould till set.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

Orchard Notes for February.

THE COASTAL DISTRICTS.

FEBRUARY in coastal Queensland is frequently a wet month, and, as the air is often heavy with moisture and very oppressive, plant growth of all kinds is rampant, and orchards and plantations are apt to get somewhat out of hand, as it is not always possible to keep weed growth in check by means of cultivation. At the same time, the excessive growth provides a large quantity of organic matter which, when it rots, tends to keep up the supply of humus in the soil, so that, although the property looks unkempt, the fruit-producing trees and plants are not suffering, and the land is eventually benefited. When the weed growth is excessive and there is a danger of the weeds seeding, it is a good plan to cut down the growth with a fern hook or brush scythe and allow it to remain on the ground and rot, as it will thereby prevent the soil from washing, and when the land is worked by horse power or chipped by hand it will be turned into the soil. This is about the most satisfatcory way of dealing with excessive weed growth, especially in banana plantations, many of which are worked entirely by hand.

The main crop of smooth leaf pineapples will be ready for canning, and great care must be taken to see that the fruit is sent from the plantation to the cannery with the least possible delay and in the best possible condition. The only way in which the canners can build up a reputation for Queensland canned pineapples is for them to turn out nothing but a high-class article. To do this they must have good fruit, fresh, and in the best of condition.

The fruit should be about half-coloured, the flesh yellowish, not white, of good flavour, and the juice high in sugar content. Over ripe fruit and under-ripe fruit are unfit for canning, as the former has lost its flavour and has become "winey," while the latter is deficient in colour, flavour, and sugar content.

For the 30 or 32 oz. can, fruit of not less than 5 in. in diameter is required, in order that the slices will fit the can; but smaller fruit, that must not be less than 4 in. or, better still, 4½ in. in diameter, and cylindrical, not tapering, can be used for the 20-22 oz. can.

Bananas for shipment to the Southern States should on no account be allowed to become over-ripe before the bunches are cut; at the same time, the individual fruit should be well filled and not partly developed. If the fruit is over-ripe it will not carry well, and is apt to reach its destination in an unsaleable condition.

Citrus orchards require careful attention, as there is frequently a heavy growth of water shoots, especially in trees that have recently been thinned out, and these must be removed. When there are facilities for cyaniding, this is a good time to carry out the work, as fruit treated now will keep clean and free from scales till it is ready for market. Citrus trees can be planted now where the land has been properly prepared, and it is also a good time to plant most kinds of tropical fruit trees, as they transplant well at this period of the year.

A few late grapes and mangoes will ripen during the month, and, in respect to the latter, it is very important to see that no fly-infested fruit is allowed to lie on the ground but that it is gathered regularly and destroyed. Unless his is done, there is every probability of the early citrus fruits being attacked by flies bred out from the infested mangoes.

Strawberries may be planted towards the end of the month, and, if early ripening fruit is desired, care must be taken to select the first runners from the parent plants, as these will fruit quicker than those formed later. The land for strawberries should be brought into a state of thorough tilth by being well and deeply worked. If available, a good dressing of well-rotted farmyard manure should be given, as well as a complete commercial fertilizer, as strawberries require plenty of food and pay well for extra care and attention.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELAND.

THE marketing of later varieties of peaches and plums and of mid-season varieties of apples and pears, as well as of table grapes, will fully occupy the attention of fruitgrowers in the Granite Belt, and the advice given in these notes for the two previous months with regard to handling, grading, packing, and marketing

is again emphasised, as it is very bad policy to go to all the trouble of growing fruit and then, when it is ready to market, not to put it up in a way that will attract buyers.

Extra trouble taken with fruit pays every time. Good fruit, evenly graded and honestly packed, will sell when ungraded, and badly packed fruit is a drug on the market. Expenses connected with the marketing of fruit are now so high, owing to the increased cost of cases, freight, and selling charges, that it is folly to attempt to market rubbish.

During the early part of the month it will be necessary to keep a careful watch on the crop of late apples in order to see that they ore not attacked by codlin moths. If there is the slightest indication of danger, a further spraying with arsenate of lead will be necessary, as the fruit that has previously escaped injury is usually that which suffers the most.

Fruit fly must also be systematically fought wherever and whenever found, and no infested fruit must be allowed to lie about on the ground.

Grapes will be ready for market, and in the case of this fruit the greatest care in handling and packing is necessary. The fruit should never be packed wet, and, if possible, it is an excellent plan to let the stems wilt for a day at least before packing. This tends to tighten the hold of the individual berries on the stem and thus prevent their falling off.

In the western districts winemaking will be in progress. Here again care is necessary, as the better the condition in which the fruit can be brought to the press the better the prospect of producing a high-class wine.

Where necessary and possible citrus trees should be given a good irrigation, as this will carry on the fruit till maturity, provided it is followed up by systematic cultivation so as to retain a sufficient supply of moisture in the soil.

Farm Notes for February.

REFERENCE was made in last month's Notes to the necessity for early preparation of the soil for winter cereals, and to the adoption of a system of thorough cultivation in order to retain moisture in the subsoil for the use of crops intended to be raised during the season. The importance of the subject, and its bearing in relation to prospective crop yields, is made the excuse for this reiteration.

Special attention should be given to increasing the area under lucerne (broadleaf Hunter River) wherever this valuable crop will grow. Its permanent nature warrants the preparation of a thorough tilth and seed bed, and the cleansing of the land, prior to sowing the seed, of all foreign growths likely to interfere with the establishment and progress of the crop. Late in March or early in April is a seasonable period to make the first sowing providing all things are favourable to a good germination of seed.

Dairymen would be well advised to practise the raising of a continuity of fodder crops to meet the natural periods of grass shortage, and to keep up supplies of succulent fodder to maintain their milch cows in a state of production.

Many summer and autumn growing crops can still be planted for fodder and ensilage purposes. February also marks an important period as far as winter fodder crops are concerned, as the first sowings of both skinless and cape barley may be made at the latter end of the month in cool districts. Quick-growing crops of the former description, suitable for coastal districts and localities where early frosts are not expected, are Soudan grass, Japanese and French millet, white panicum, liberty millet, and similar kinds belonging to the Setaria family. Catch crops of Japanese and liberty millet may also be sown early in the month in cooler parts of the State, but the risk of early frosts has to be taken.

Maize and sorghums can still be planted as fodder and ensilage crops in coastal districts. In both coastal and inland areas, where dependence is placed largely on a bulky crop for cutting and feeding to milch cows in May and June, attention should be given to Planters' Friend (so-called Imphee) and to Orange cane. These crops require well-worked and manured land; the practice of broadcasting seed for sowing at this particular season encourages not only a fine stalk but a density of growth which in itself is sufficient to counteract to some extent the effect of frost.

In most agricultural districts where two distinct planting seasons prevail, the present month is an excellent time for putting in potatoes. This crop responds to good treatment, and best results are obtainable on soils which have been previously well prepared. The selection of good "seed" and its treatment against the possible presence of spores of fungoid diseases is imperative. For this purpose a solution of 1 pint of formalin (40 per cent. strength) to 24 gallons of water should be made up, and the potatoes immersed for one hour immediately prior to planting the tubers. Bags and containers of all kinds should also be treated, as an additional precaution. "Irish Blight" has wrought havoc at times in some districts, and can only be checked by adopting preventive measures and spraying the crops soon after the plants appear above the ground. Full particulars on the preparation of suitable mixtures for this purpose are obtainable on application to the Department of Agriculture, Brisbane.

Weeds of all kinds, which started into life under the recent favourable growing conditions, should be kept in check amongst growing crops; otherwise yields are likely to be seriously discounted. The younger the weeds the easier they are to destroy. Maize and other "hoed" crops will benefit by systematic cultivation. Where they are advanced, and the root system well developed, the cultivation should be as shallow as possible consistent with the work of weed destruction.

First sowings may now be made of swede and other field turnips. Drilling is preferable to broadcasting, so as to admit of horse hoe cultivation between the drills, and the thinning out of the plants to suitable distances to allow for unrestricted development. Turnips respond to the application of superphosphate; 2 cwt. per acre is a fair average quantity to use when applied direct to the drills.

Where pig raising is practised, land should be well manured and put into good tilth in anticipation of sowing rape, swedes, mangels, field cabbage, and field peas during March, April, and May.

PLATE 25.

Lake Nuga-Nuga, covering a drowned forest resulting from the overflow of Mooleyamba Creek at Warranilla, below the head of the Browne River, a tributary of the Dawson.

[Photo.: Mr. J. L. Bowman.

CLIMATOLOGICAL TABLE—NOVEMBER, 1933.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points	
Cooktown	29 84	86	73	89	23	71	8, 9, 15, 17, 21, 24 25, 29	245	8
Herberton	..	79	61	87	22	54	16	601	14
Rockhampton	29 95	82	67	91	23	61	13	514	12
Brisbane	30 03	77	63	84	26	58	3	841	19
Darling Downs.									
Dalby	29 99	79	60	87	3	50	2	716	15
Stanthorpe	..	72	53	80	2, 3	47	3	541	17
Toowoomba	..	73	57	85	3	51	3	845	21
Mid-interior.									
Georgetown	29 86	94	64	99	2	53	1	796	7
Longreach	29 88	90	66	99	25	60	12	624	12
Mitchell	29 94	80	62	92	3	49	10	793	14
Western.									
Burketown	29 84	93	74	100	22	67	13	46	1
Boulia	29 84	95	69	107	17	59	21	102	4
Thargomindah .. .	29 89	87	67	105	1	56	10	216	6

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING NOVEMBER, 1933, AND 1932, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Nov.	No. of Years' Records	Total Rainfall. Nov., 1933.	Nov., 1932.
North Coast.	In.		In.	In.
Atherton	2·19	32	5·14	0·27
Cairns	3·75	51	14·04	1·68
Cardwell	4·00	61	11·48	1·75
Cooktown	2·56	57	2·45	0·93
Herberton	2·49	47	6·01	0·07
Ingham	3·65	41	13·81	5·16
Innisfail	6·06	52	23·65	1·56
Mossman Mill ..	4·06	20	9·50	1·73
Townsville	1·82	62	5·86	1·98
Central Coast.				
Ayr	1·63	46	5·02	1·48
Bowen	1·25	62	3·57	0·13
Charters Towers ..	1·45	51	2·92	1·32
Mackay	2·99	62	13·65	1·39
Proserpine	2·65	30	10·81	0·99
St. Lawrence ..	2·27	62	7·89	0·85
South Coast.				
Biggenden	2·72	34	5·80	1·16
Bundaberg	2·44	50	6·66	0·56
Brisbane	3·78	82	8·41	2·84
Caboolture	3·39	46	8·30	2·44
Childers	2·66	38	7·82	1·60
Crohamhurst	4·34	40	11·89	4·64
Esk	3·19	46	7·44	3·75
Gayndah	2·90	62	6·38	5·31
Gympie	3·13	63	9·77	1·74
Kilkivan	2·55	54	4·50	1·77
Maryborough ..	3·11	61	8·84	1·86
Nambour	3·76	37	14·87	2·67
Nanango	2·63	51	6·87	3·12
Rockhampton ..	2·35	62	5·14	4·31
Woodford	3·17	46	7·13	1·41

Divisions and Stations.	Average Rainfall. Nov.	No. of Years' Records.	Total Rainfall. Nov., 1933.	Nov., 1932.
Central Highlands.	In.		In.	In.
Clermont	1·98	62	7·60	2·04
Gindie	2·02	34	0	3·84
Springsure	2·10	64	6·72	2·61
Darling Downs.				
Dalby	2·71	63	7·16	3·76
Emu Vale	2·69	37	6·19	3·53
Hermitage	2·65	27	0	4·39
Jimbour	2·42	45	7·84	3·67
Miles	2·49	48	9·05	3·21
Stanthorpe .. .	2·72	60	5·41	3·10
Toowoomba ..	3·29	61	8·45	5·09
Warwick	2·63	68	5·45	5·82
Maranoa.				
Roma	2·11	59	3·29	4·34
State Farms, &c.				
Bungeworgorai ..	2·13	19	0	4·14
Gatton College ..	2·80	34	11·15	4·81
Kairi	2·16	19	4·88	0·06
Mackay Sugar Experiment Station	2·64	36	11·82	2·02

GEORGE G. BOND, Divisional Meteorologist.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	January. 1934.		February. 1934.		MOONRISE. Jan. 1934.	MOONRISE. Feb. 1934.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	5·0	6·50	5·24	6·46	7·17	7·40
2	5·1	6·50	5·25	6·45	8·0	8·10
2	5·2	6·50	5·26	6·44	8·27	8·38
4	5·2	6·50	5·27	6·44	9·8	9·9
5	5·3	6·50	5·28	6·43	9·37	9·41
6	5·3	6·50	5·29	6·43	10·6	10·15
7	5·4	6·51	5·30	6·42	10·35	10·57
8	5·5	6·51	5·30	6 42	11·7	11·47
9	5·6	6·51	5·31	6·41	11·38	..
					a.m.	a.m.
10	5·6	6·51	5·32	6·41	..	12·47
11	5·7	6·51	5·32	6·40	12·17	1·51
12	5·8	6·51	5·33	6·40	1·4	3·0
13	5·9	6·51	5·34	6·39	2·0	4·11
14	5·10	6·51	5·34	6·39	3·2	5·23
15	5·11	6·51	5·35	6·38	4·12	6·30
16	5·12	6·52	5·36	6·38	5·26	7·34
17	5·13	6·52	5·36	6·37	6·39	8·37
18	5·13	6·52	5·37	6·36	7·48	9·37
19	5·14	6·52	5·37	6·35	8·52	10·36
20	5·15	6·52	5·38	6·34	9·54	11·36
						p.m.
21	5·15	6·52	5·38	6·33	10·53	12·32
22	5·16	6·52	5·39	6·32	11·53	1·28
					p.m.	
23	5·16	6·52	5·39	6·31	12·41	2·22
24	5·17	6·51	5·40	6·30	1·47	3·11
25	5·18	6·51	5·41	6·29	2·42	3·35
26	5·19	6·50	5·43	6·27	3·36	4·36
27	5·20	6·50	5·44	6·26	4·27	5·9
28	5·20	6·49	5·45	6·25	5·15	5·42
29	5·21	6·49	..	..	5·59	..
30	5·22	6·48	..	..	6·37	..
31	5·23	6·47	..	..	7·10	..

Phases of the Moon, Occultations, &c.

1 Jan.	○	**Full Moon**	6 54 a.m.
9 ,,	☽	**Last Quarter**	7 36 a.m.
15 ,,	●	**New Moon**	11 37 p.m.
22 ,,	☾	**First Quarter**	9 50 p.m.
31 ,,	○	**Full Moon**	2 31 a.m.

Perigee, 15th January, at 11.12 a.m.
Apogee, 28th January, at 5 a.m.

Jupiter rises at 2.1 a.m. on the 1st [illegible] a.m. on the 15th.

Saturn sets at 10.57 p.m. on the 1st [illegible] p.m. on the 15th.

At Brisbane—The Southern [illegible] into view until about 11 p.m. [illegible] in the S.S.E., head slanting [illegible] the end of the month it may [illegible] about 9 p.m. At Christmas [illegible] noticeably absent during the ev[illegible]

Mercury will pass from Libra [illegible] the 1st and 15th; on the [illegible] half a degree of Beta Scorpii. [illegible]

Venus will pass from Sagit[illegible] by the 15th, and Mars [illegible] Sagittarius during the month[illegible]

The Earth's nearest approa[illegible] on 2nd January, when fortun[illegible] will separate them.

On the 6th, at 3 p.m., the [illegible] will [illegible] from west to east of Nept[illegible], which [illegible] degrees north of it. Three days later [illegible] will pass Jupiter at a distance of [illegible] degrees.

Venus, near the border of Aq[illegible] stationary on the 13th, then [illegible] Right Ascension 21.39 to 21 hours [illegible] the 31st.

Antares will be occulted by [illegible] when below the horizon in Qu[illegible]

When the Sun sets on the [illegible] the New Moon will be so close to [illegible] to be [illegible] lost in the Sun's great light.

It will be interesting to notice that on [illegible] of the 15th Mars will set at 8.9 p.m., Satu[illegible] and Venus at 8.24, and that Mars and [illegible] draw nearer to one another till the 18th, [illegible] they will be getting wider apart.

At 9 a.m. on the 17th Mercury wil[illegible] junction with the Moon when in the [illegible] by east. An hour later Saturn will be [illegible] with the Moon, also in broad dayli[illegible] later, at 8 p.m., Venus too will be [illegible] with the Moon.

On the 20th Mercury will be on the farthest side of its orbit, almost in a line with the Sun, but a degree and a-half on the south side of it.

7 Feb.	☽	**Last Quarter**	7 22 p.m.
14 ,,	●	**New Moon**	10 43 a.m.
21 ,,	☾	**First Quarter**	4 5 p.m.

Perigee, 12th February, at 9.18 p.m.
Apogee, 24th February, at 8.12 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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Event and Comment.

Tropical Agricultural Research.

TROPICAL agricultural development in Queensland has become a matter of major importance. Writing on this subject recently, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, said:—

When the solvency of any particular territory depends on a single form of production that locality is a hostage to fortune. This fact has been forcibly if painfully demonstrated during the past few years in our exclusively pastoral areas of the West.

In the North sugar is queen. No other primary industry of a major nature exists, and neither individuals nor institutions can feel secure or confident under this state of affairs. Sugar, of course, could never be dethroned under normal conditions, but we have reached our limits of production in this direction, and must cast about for new avenues of activity.

Necessarily these do not lie in an expansion of secondary industries, but in a closer realisation of our agricultural possibilities. An almost identical position confronted the peoples of the British West Indies, and a tropical research and experiment station was established in an endeavour to provide an answer to the often repeated question, "What agricultural possibilities do the islands offer?" The result has been a surprisingly successful agricultural development, and the institute has obtained world-wide recognition. What Trinidad has done for the Indies the proposed Tropical Research Station at South Johnstone

may accomplish for tropical Queensland, and not only for the northern portion of our State, but for a quarter of the continent, and for the mandated islands under our control.

The proposed location is ideal, for both soil and climate are characteristic of the North. Results, however, will not be obtained in a day or a year. Agricultural research is tedious but inspiring for that small band of men, and latterly of women, who have embarked upon it. The scope of the Bureau will embrace agricultural research, tropical agricultural education and supplementary dietary investigation.

The first of these—agricultural research, and at this institution the most important—will be divided into two groups: the "short-term phase" and the "long-term phase." The first of these will be directed towards the greater application of scientific principles of agriculture, in relation to existing Australian tropical agricultural industries, other than the sugar industry.

Included in this programme will be soil surveys, varietal, fertilizer and cultural trials, improvement of varieties by breeding and selection, and plant protective investigation in entomology or pathology. The crops receiving attention under this section will be maize, tobacco, pastures, and fruit. In the case of fruit, particular attention will be given to the development of supplies of known producing strains, together with suitable standardised stocks, in order to produce a uniform result.

The "long-term phase"—the eminent justification for the establishment of the station—will take the form of fundamental investigation of the possibilities, both agricultural and economic, of at present non-existent tropical agricultural industries. This work will include the introduction, acclimatisation, and selection of strains of plants most suited to tropical Australian conditions, the determination of the most suitable regions in tropical Queensland for the growth of such plants, the development of the most suitable agricultural practices, methods of harvesting and marketing of crops.

The successful development of such industries will naturally be dependent upon economic rather than climatic factors. Particular attention, therefore, will be paid to the development of cultural and harvesting methods, which are less dependent upon unskilled labour than is the case in the other tropical countries of the world. Tropical products which are imported into Australia and which suggest themselves as being desirable of investigation are tea, coffee, cocoa, hemp, spices, kapok, tapioca, edible nuts, vanilla, rubber, and fruits which at present are not grown commercially, such as the mangosteen and the avocado pear.

It is not suggested that the crops enumerated above will all succeed. Were success certain the necessity for a bureau would disappear, but such work constitutes a prerequisite to the successful and permanent agricultural colonisation of the most vulnerable part of our continent.

It must be remembered that educationally no facilities exist anywhere in Australia to provide a training in tropical agriculture for our college and university graduates. South Johnstone will fill this need.

On the establishment of the bureau arrangements will be made to offer facilities to approved graduates to undertake a post-graduate course in tropical agriculture. By this arrangement the research facilities of the University will be definitely linked with a new and important arm of agricultural development.

Agriculture in the tropics is different in many respects from agriculture in the temperate zones, and, in addition to the South Johnstone station, there is, therefore, in contemplation the conversion of Kairi State Farm on the Atherton Tableland into an institution for the imparting of agricultural knowledge associated with certain investigation work. What we contemplate is not another agricultural college but a farm school which will conform to the general requirements of practical agriculture.

We must avoid at all costs the raising of a generation of agricultural labourers. A sound understanding of the principles of agriculture or the absence of this understanding makes all the difference between the agriculturist and the agricultural labourer. Kairi will provide the possibility for this distinction. The Atherton Tableland, with its congenial climate, wonderful soils, and natural agricultural utility, is an ideal setting for the school. In addition, problems of first magnitude can be investigated at first hand on the Tableland in conjunction with the bureau at South Johnstone. Of these the most important is the production of high protein grasses and crops, assets in which the Tableland is conspicuously deficient at the present time.

The two organisations, taken in conjunction, will provide for the well-balanced application of all that is best in agriculture, and should make a valuable contribution to the future development of what is probably the most fertile area in Australia—an area which is merely waiting for a complete understanding of its many difficulties and variations to yield wealth and happiness to the people of the North and to Queensland generally.

Financing the Wheat Pool.

IN reply to a question as to how the wheatgrowers would fare concerning a first advance, which it had been claimed was held up owing to his (the Minister's) decision to extend to 22nd January the date for receipt of a petition for a ballot on the question of the extension or otherwise of the Wheat Pool, the Minister for Agriculture and Stock (Mr. F. W. Bulcock) stated that he understood that the Wheat Board, prior to the extension of the date for the receipt of the petition, had made arrangements with the Commonwealth Bank for suitable financial accommodation.

"I am not aware," said the Minister, "of the nature of that accommodation, but in view of the statement made on behalf of the Board that satisfactory financial arrangements had been made prior to the 8th instant, I confidently anticipate that the Board will now be in a position to expedite the payment of the first advance."

Ticks Infesting Domesticated Animals in Queensland.

By F. H. S ROBERTS, M.Sc., Entomologist, Animal Health Station, Yeerongpilly.

THE intention in this article has been not only to give an account of the several species of ticks infesting domestic animals in Queensland, but also to place in the hands of the interested stockowner information which it is hoped will enable him to recognise the more important species.

Life History of Ticks.

In the life history of Ixodid ticks four distinct stages are recognised —namely, the egg, the larva, the nymph, and the adult. When engorged the female tick drops from the host animal to the ground, crawls to some sheltered spot, and lays her eggs. After a period, dependent mainly upon temperature and humidity, these eggs hatch to give rise to the tiny larvæ (Plate 26, figs. 6 and 7). The larvæ or seed ticks, as they are frequently called, have only three pairs of legs in contrast to the adult tick's four pairs After a time sufficient for the body parts to harden the larva crawls up to the top of the grass or some other convenient point, and is eventually brushed off by its host, to which it adheres. A suitable spot on the host animal is found, and the tiny larva inserts its mouth parts and begins to suck blood. When fully fed it may drop off the host to the ground or remain attached to its host, in either case finally casting its skin to appear as a nymph. The nymph has four pairs of legs like the adult, but is not sexually mature and has no genital orifice. If the moult has occurred on the ground, the nymph repeats the activities of the larva, and soon becomes attached to another host. After attachment the nymph in its turn engorges and may detach itself and drop off or remain on the host to undergo the second moult. And now the sexually mature adult appears. The host is eventually reached in the manner of the larva and nymph, and the adult tick begins to feed. The sexes mate and the female engorges rapidly, eventually becoming enormously swollen with blood. She then drops off, lays her eggs, shrivels up and dies

DESCRIPTION OF PLATE 26.

Fig 1. *Longirostrata*—A tick with long mouth parts. (*a*) Mandibles; (*b*) Mandibular sheath; (*c*) Palp; (*d*) Eye; (*e*) Scutum or dorsal shield.

Fig. 2. Ventral view of the Capitulum of a tick showing the mouth parts. (*a*) Mandibles; (*b*) Hypostome; (*c*) Palp.

Fig. 3. *Brevirorstrata*—A tick with short mouth parts. In this tick—a male—the scutum covers the whole of the back.

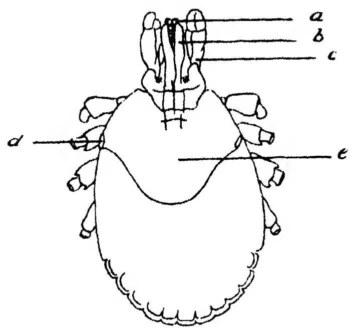
Fig. 4. *Brevirostrata.*—A female tick with the scutum extending over only a small area near the head.

Fig. 5. *Prostriata.*—The anal grove contours, the anus in front. (*a*) Anus; (*b*) Anal groove.

Fig. 5A. *Metastriata.*—The anal grove contours, the anus behind. (*a*) Anus; (*b*) Anal groove.

Fig. 6.—Larva of the cattle tick, ***Boophilus microplus*** Canes.

Fig. 7. Larva of the scrub tick, ***Ixodes holocyclus*** Neum.



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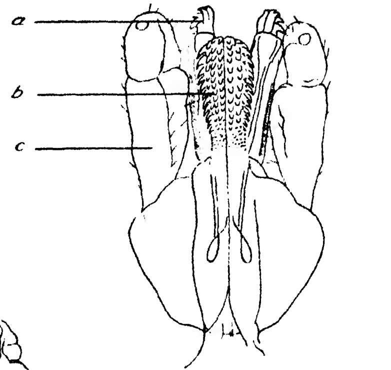

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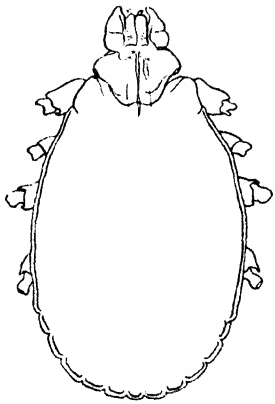

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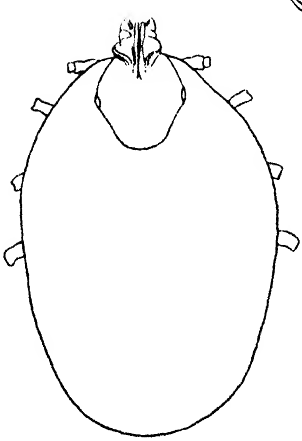

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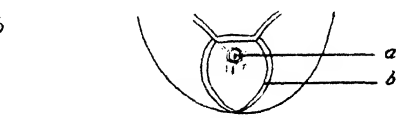

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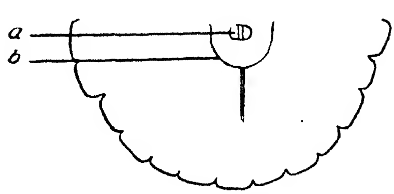

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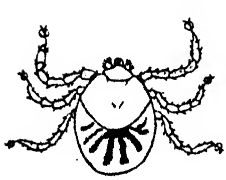

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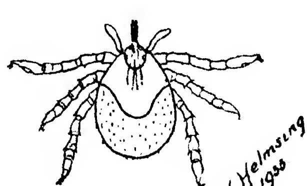

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Plate 26.

A tick which is able to complete its life history without at any time leaving its host is called a one-host tick. Should it drop to the ground to undergo the larval and nymphal moults, it becomes a three-host tick, whilst only one moult occurring on the ground and the others on the host makes it a two-host tick.

The life history of the poultry tick, *Argas persicus,* is, however, different to that of Ixodid ticks. The adult female may lay several batches of eggs, which hatch into typical six-legged larvæ. The larvæ attach themselves to the birds and remain on them till fully engorged. There are then two nymphal stages before the adult phase is reached and, like the adult, these two nymphal forms feed only at night, remaining hidden in cracks and crevices during the day.

Structure of Ticks.

Generally speaking, ticks have an undivided oval-shaped body protected externally by a leathery cuticle. At the anterior end is a structure known as the capitulum (Plate 26, figs. 1 and 2) which carries the mouth parts, whilst the body proper bears the legs, of which there are four pairs in the adult stage. The mouth parts consist of the beak and the palpi. The beak includes the hypostome, mandibular sheath, and mandibles (Plate 26, figs. 1 and 2). The hypostome can be seen ventrally, is club-like in shape, and provided with rows of recurved teeth (Plate 26, fig. 2). The mandibles are used when the tick is piercing the skin, and the rows of recurved teeth on the hypostome explain why a tick when pulled out so often leaves its "head" behind. On the dorsal surface can be seen in most species a hard shield--the scutum—which in the male covers practically the whole of the back and in the female a smaller area close to the capitulum (Plate 26, figs. 1e, 3, and 4). Eyes may be present or absent, and if present may be detected close to the lateral angle of the scutum (Plate 26, fig. 1d.). On the ventral surface will be found the genital and anal openings. The former is usually situated far forward between the coxæ of the legs, whilst the latter is nearer the posterior margin and generally partly enclosed in front or behind by a grove—the anal grove—a character of great importance in determining the various species (Plate 26, figs. 5 and 5a)

Classification of Ticks.

The super-family to which the ticks belong is known as the *Ixodoidea,* which is divided into the families *Argasidæ* and *Ixodidæ.* In the *Argasida* there is no dorsal shield or scutum, the back being provided with a tough, leathery integument only. Moreover, the mouth parts and palps are invisible when viewed from above, being placed ventrally (Plate 26, figs. 7 and 8). In the *Ixodidæ* these parts are terminal and a scutum is always present (Plate 27, figs. 1-6). The *Ixodidæ* are then divided into the *Prostriata,* in which the anal grove contours the anus in front (Plate 26, fig. 5) and the *Metastriata* where it contours the anus behind (Plate 26, fig. 5a). Finally, the *Metstriata* comprise the short mouth part ticks, the *Brevirostrata* (Plate 26, figs. 3 and 4), and the long mouth part ticks, the *Longirostrata* (Plate 26, fig. 1).

The Poultry Tick (*Argas persicus* Oken 1818).

(Plate 27, figs. 7 and 8.)

This is a cosmopolitan species, and is to be found in every part of this State. It not only attacks fowls, but also ducks and pigeons. It appears to thrive in the drier parts of Queensland, and is regarded as a serious pest of poultry wherever it occurs. This species, except in the larval stage, feeds only at night, and when present in numbers may cause serious mortalities, especially among young birds. Its survival in fowl-houses which have remained empty for considerable periods of time is astounding. One such record made in one of the hottest and driest parts of the State is that of a fowl-house which remained infested for two and a-half years, during the whole of which time it was not inhabited by fowls.

The prevalence of *spirochætosis* among fowls in Queensland is not known to any degree of accuracy, but frequently cases have been encountered where mortalities have definitely been caused by this disease.

The poultry tick is a flat, oval, leathery tick, without a dorsal shield or eyes. The mouth parts are entirely invisible when viewed from the dorsal surface, which is marked with numerous symmetrically arranged discs more or less disposed in radial lines.

The Scrub Tick (*Ixodes holocyclus* Neumann 1899).

(Plate 27, figs. 3 and 4.)

This tick also known as the "bottle" tick appears to be confined to the coastal scrubs, with a distribution as far west as Toowoomba, and extending northwards to the Atherton Tableland and Norman River. Its native hosts comprise the wallaby, kangaroo, opossum, bandicoot, native bear, pouched mouse, &c., among which it does not appear to cause any great inconvenience. On man and the domesticated animals, however, the presence of this tick may be responsible for a serious condition, which may be followed by paralysis and death. Such fatalities are especially noticeable among dogs and sheep, but deaths from scrub tick attack is also known among cats, foals, calves, pigs, fowls, ducks, and even man. In several North Coast areas the successful raising of sheep is prevented mainly through the mortalities from this tick, especially during the spring months.

This species is a three-host tick—that is, the larva and nymph drop from the host in order to undergo the moulting process, gaining a new host when the new stage appears. The male is an oval tick, rounded behind, and somewhat reddish-yellow in colour. The mouth parts are terminal, long and prominent. The partly-fed female is greyish, but when fully engorged this sex becomes very large and dark red. If the anal grove is examined, it will be found that in both sexes it contours, the anus in front converging behind, so that it meets at the edge of the body in the female, but remains narrowly open in the male.

The Opossum Tick (*Ixodes tasmani* Neumann 1899).

There is a single record of this tick occurring on a horse. Other hosts from which the opossum tick have been collected include the opossum, native bear, native cat, and man. This species has been recorded from Gayndah, Eidsvold, Bundaberg, Brisbane, Logan, Boyne Valley, Jondaryan, Harrisville, and Roma.

The opossum tick is very similar to the scrub tick, but may be distinguished by the anal grove, which is this species is not convergent behind but remains almost parallel.

The Brown Dog Tick (*Rhipicephalus sanguineus* Latreille 1804).

(Plate 28, figs. 3 and 4.)

Like the poultry tick, the brown dog tick is a cosmopolitan species, and may be found anywhere in Queensland. Some of the heaviest infestations have been observed in the driest and most remote portions of the State. Infestation of dwellings by this tick are not uncommon, due to carelessness in allowing infested dogs indoors. The fact that this is a three-host tick and that the dog is a thoroughly domesticated animal probably explains its wide distribution. In other parts of the world the brown dog tick is a vector of canine pyroplasmosis, but so far as can be ascertained this disease is not present among dogs in Australia.

The brown dog tick bears a superficial resemblance to the cattle tick, but may be readily recognised by its brown legs, the presence of an anal grove, and by the conspicuous bifid first coxæ. Other hosts on which this tick may be found are sheep, cattle, horse, cat, and man.

The Cattle Tick (*Boophilus microplus* Canestrini).

(Plate 27, figs. 1 and 2.)

This species, previously known as *B. australis*, is without doubt the most important of all ticks found in Queensland. It is not a native species, and occurs also in Asia, South America, and South Africa. Its importance lies in the fact that not only has it found climatic conditions so suitable for its development that it has become a serious cattle pest in itself, but it is also the vector of *Piroplasma bigeminum*, which is responsible for cattle-tick fever and probably of two or three other organisms which are possibly concerned with other serious cattle diseases.

This cattle tick is a one-host tick. It may be readily distinguished from other ticks found on cattle in Queensland by the following features:—

(1) The mouth parts are small and the palps do not project laterally at their base as in some species of *Hæmaphysalis*.

(2) Eyes are present. In the species of *Hæmaphysalis*, with which *B. microplus* is most likely to be confused, eyes are absent.

DESCRIPTION OF PLATE 27.

CATTLE TICK—*Boophilus microplus* Canes.

Fig. 1.—Male × 5. Fig. 2.—Female × 5.

SCRUB TICK—*Ixodes holocyclus* Neum.

Fig. 3.—Male × 5. Fig. 4.—Female × 5.

WALLABY TICK—*Hæmaphysalis bancrofti* (Warburton and Nuttall).

Fig. 5.—Male × 5. Fig. 6.—Female × 5.

FOWL TICK—*Argas persicus* Oken.

Fig. 7.—Male × 7. Fig. 8.—Female × 7.

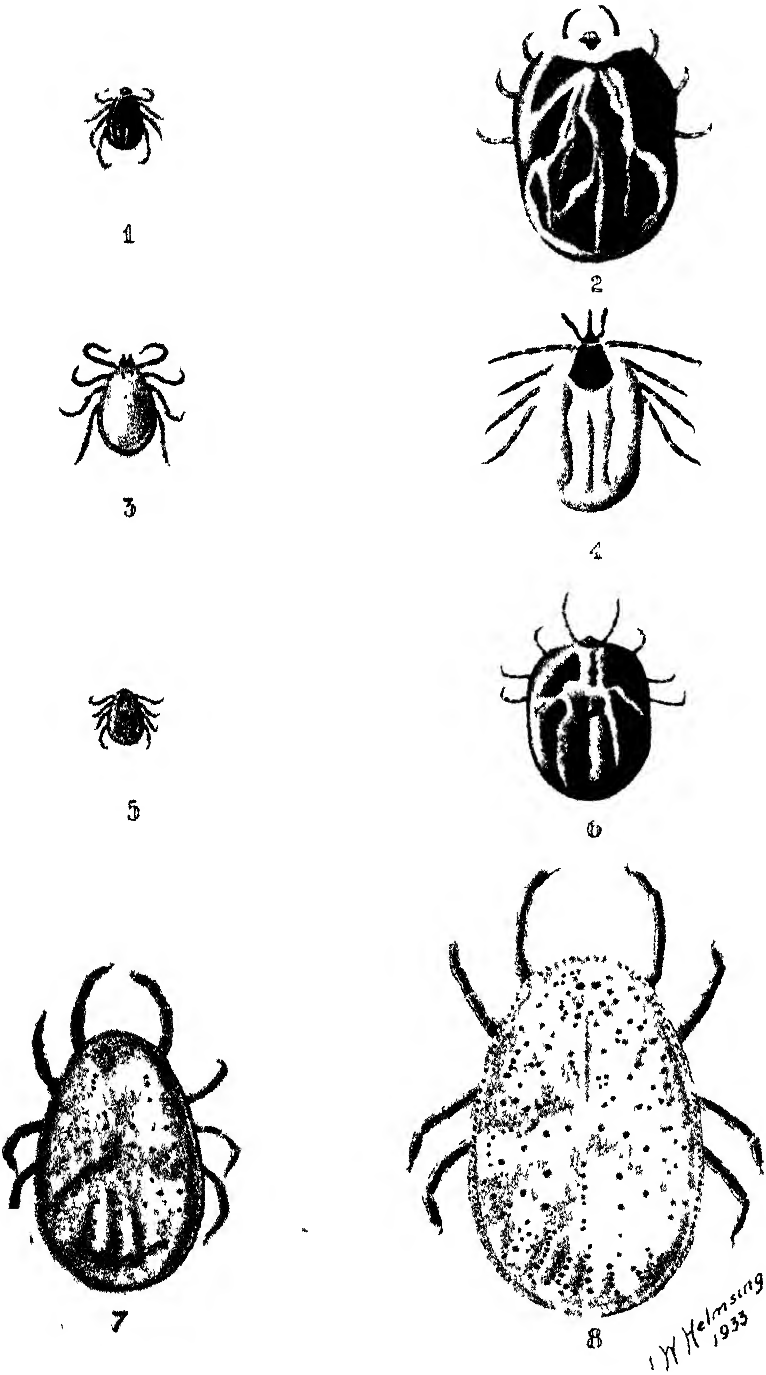


Plate 27

(3) There is no apparent anal grove.

(4) The legs are short and very pale. *B. microplus* is the only species of tick with short mouth parts and with pale almost whitish legs.

This species has also been recorded from horses, sheep, and dogs.

The Wallaby Tick (*Hæmaphysalis bancrofti* Warburton and Nuttall 1915).

(Plate 27, figs. 5 and 6.)

The species of the genus *Hæmaphysalis* have a distinct anal grove, usually laterally projecting palps and no eyes. The wallaby tick is frequently found on cattle and is recorded from Townsville, Rockhampton, Murgon, Maleny, Brisbane, Kingaroy, Helidon, Toowoomba, and Maryvale. It appears to be confined to the southern portion of the State, mainly the south-east. It has also been collected from the kangaroo, rat-kangaroo, opossum, and man. In this species the legs are brown, the mouth parts short, and the palps project very strongly laterally. The life history is unknown, but like other species of the genus it is probably a three-host tick.

The New Zealand Cattle Tick (*Hæmaphysalis bispinosa* Neumann 1897).

(Plate 28, figs. 1 and 2.)

This introduced species is found in India, Burma, Borneo, Malay States, Japan, East Africa, and New Zealand, as well as in Australia. It is said to be very commonly found on cattle on the north coast of New South Wales, but in Queensland, so far as the records show, it is by no means common. Specimens have been taken from cattle at Tullebudgera, Toowoomba, Bell, Jondaryan, Killarney, Helidon, Murgon, and from horses at Taroom and Gympie. This species may readily be mistaken for the common cattle tick, but its brown legs and the presence of an anal grove and a prominent dorsal spine on the third segment of the palps readily distinguish it. This species is a three-host tick.

The Slender Opossum Tick (*Hæmaphysalis humerosa* Warburton and Nuttall 1929).

Among the material examined there are specimens of this tick from cattle at Rockhampton and a horse at Helidon. It has also been collected from bandicoots and opossums at Maryborough, Harrisville, and Springsure The dorsal shield or scutum in this species is much longer than

DESCRIPTION OF PLATE 28.

Hæmaphysalis bispinosa Neum.

Fig. 1.—Male × 5. Fig. 2.—Female × 5.

Rhipicephalus sanguineus Latr.

Fig. 3.—Male × 5. Fig. 4.—Female × 5.

Hyalomma ægyptium Linné.

Fig. 5.—Female × 5.

Amblyomma triguttatum Koch.

Fig. 6.—Male × 5. Fig. 7.—Female × 5.

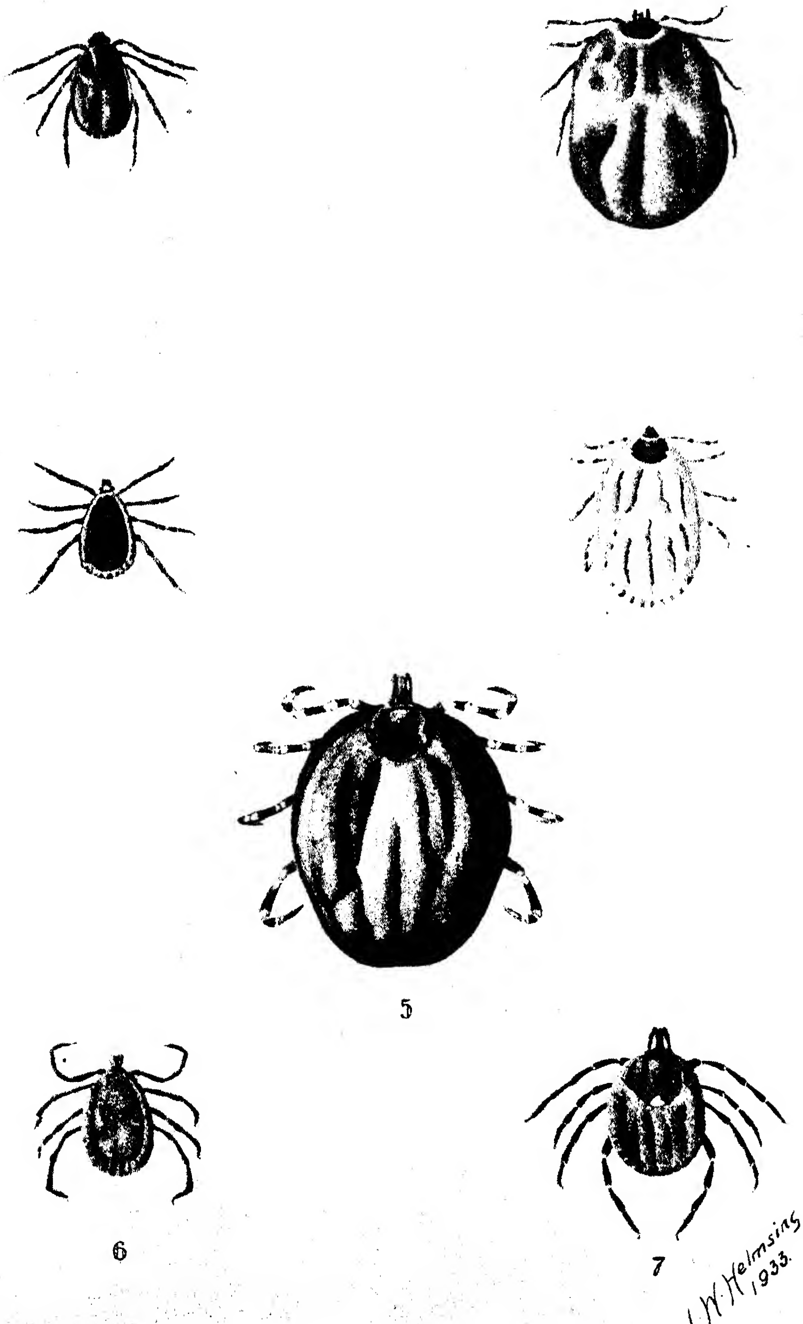


Plate 28.

broad, giving the male a long, slender appearance, a peculiarity which is not quite so marked in the female.

The African Dog Tick (*Hæmaphysalis leachi* (Audouin 1827) (Neumann 1897)).

This species has been recorded from Australia from the wallaby and from a horse. The writer has never encountered this tick, but is informed by Dr. J. Legg, of the Animal Health Station, Townsville, that he has taken it there on sheep. This tick also occurs in Africa, India, Sumatra, Borneo, Malay States, and New Zealand. In Africa it transmits the organism of malignant jaundice or pyroplasmosis of dogs.

The Bont Leg Tick (*Hyalomma ægyptium* Linne 1758).

(Plate 28, fig. 5.)

The material examined included two females of this species from a bullock and horse respectively at Warwick. The bite of this tick is particularly severe, and has a notorious tendency to cause abscesses and sloughing of the skin. It is readily recognised by its branded legs and dull brown body. This and the remaining species dealt with hereafter belong to the *Longirostrata*—that is, the mouth parts are conspicuous and long. The bont leg tick is very common in India and Africa, and has also been recorded from parts of Europe. This is a two-host tick.

The Kangaroo Tick (*Amblyomma triguttatum* Koch 1844).

(Plate 28, figs. 6 and 7.)

As this species is normally found on kangaroos, its distribution in Queensland is fairly extensive. Localities from which it has been recorded extend from Burketown and the Norman River in the north to the Logan River in the south, and as far west as Camooweal, Longreach, and Augathella. Domesticated animals from which it has been collected include cattle, horse, and dog, while the native hosts comprise the wallaby, platypus, and dingo, besides the kangaroo.

This tick may be readily recognised by the conspicuous coloration of the dorsal shield. In the female this shield is reddish-brown with a single whitish spot in the posterior angle. In the male there are a pair of irregular pale areas in the lateral fields and a pair of smaller spots posteriorly. Variations in this colour scheme are frequent, the most usual being to find on the female scutum an irregular pale area laterally in addition to the posterior spot. The male scutum may show a broad median band with extensive lateral markings. The life history of the kangaroo tick is unknown.

The Snake Tick (*Amblyomma moreliæ* L. Koch 1867).

The native hosts of this species include several species of snakes and goannas, the wallaby, and kangaroo. The domesticated animals from which this tick has been collected comprise cattle at Hughenden and a horse at Rosewood. Other locality records are Ingham, Bowenville, Toowoomba, and Esk. The male tick has two pairs of irregular pale areas in the scapular fields of the dorsal shield and two or three pairs of small spots behind the eyes and extending along the conspicuous marginal grove posteriorly. The female has a reddish-brown dorsal shield with a marked but irregular pale area near each eye.

The Bont Tick (*Amblyomma hebræum* Koch).

There is a female of this species in the departmental collection. The locality is not legible on the label and the host is given as a horse. The presence of this tick in Queensland is therefore not at all certain.

The Goanna Tick (*Aponomma trimaculatum* Lucas 1878).

In this genus the eyes are absent, and, as in *Amblyomma*, the mouth parts are conspicuous and long. The males are usually small, broad, and almost circular in outline, the females being larger and somewhat similar in appearance. This species is a small brilliantly coloured tick occurring in North Queensland and New Guinea. The usual hosts are snakes and goannas, but among the material is a specimen from a horse at Townsville.

Instructions for Collecting Ticks.

The species of ticks occurring in Queensland are by no means adequately known, and great assistance could be given by interested persons by forwarding any specimens they may come across. Ticks may occur on any of the domestimated animals, the many species of marsupials, snakes, goannas, lizards, tortoises, and birds. In the case of birds, ticks are frequently found in the nests. The specimen should be detached by a slow, gentle pull, so that the mouth parts are not injured, and forwarded in a match box, packed round with paper to prevent the specimens moving about, or in spirit, to the Animal Health Station, Yeerongpilly, Brisbane.

ACKNOWLEDGMENT.

The writer desires to acknowledge his appreciation of the illustrations by Mr. I. W. Helmsing, Illustrator, Entomological Branch, through the courtesy of the Chief Entomologist, Mr. Robert Veitch.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

Banana Thrips Control.

By ROBERT VEITCH, B.Sc. Agr., B.Sc. For., F.E.S., Chief Entomologist.

THE very small and insignificant insect known as the banana thrips (*Scirtothrips signipennis* Bagnall) occupies second place in the list of Queensland insect enemies of the banana, for it has to yield pride of place to the banana weevil borer (*Cosmopolites sordida* Chevr.) which is present in practically every large banana-growing district in Queensland.

The sum total of losses due to the borer is undoubtedly greater than that resulting from the activities of the thrips, but two significant differences in the incidence of infestation merit attention. Firstly, losses in the quantity and quality of fruit as a result of borer attack are greater than is generally realised, mainly because borer infestation is not very obvious; on the other hand, the rust produced in a severe thrips attack cannot possibly escape notice. Secondly, where thrips does occur in epidemic proportions with severe associated rust, virtually the whole cut of fruit on a plantation may be lost. Hence, although a State-wide estimate of losses shows weevil borer to be responsible for the greater damage, it actually happens that in certain restricted areas thrips is a much more destructive insect in so far as the reduction of marketed fruit is concerned.

Distribution in the State.

The banana thrips is well distributed throughout Queensland and occurs in small numbers in quite a number of districts in which banana-growers have sustained no losses of fruit, and, indeed, in some cases the growers are not even aware of the presence of the insect, which can, of course, be readily overlooked unless carefully searched for. There are, however, two districts in which it has been abnormally abundant and in which it has been responsible for devastating losses; these are Gympie and the far north of Queensland. A very serious outbreak occurred in the Gympie district in 1924, but for a number of years thereafter losses were comparatively slight. However, in 1931 the position once more became acute and further serious losses occurred. The history of the Gympie outbreaks thus indicates a very pronounced seasonal fluctuation in losses, and shows that although losses may be serious one year it does not necessarily follow that they will continue so without interruption. The second district in which losses have been very heavy is the coastal banana-producing area north of Cardwell, in North Queensland.

Nature of Injury.

Both the larval and adult thrips feed on the skin of the fruit, and the term "rust" has been appropriately used to denote the type of injury characteristic of outbreaks of this pest. Rust in bananas, however, is in no way analogous to rust in wheat, for the latter is due to the presence of a fungus, whereas the former is the reaction of the skin of the fruit to the feeding of an insect. The attacked skin presents a typical reddish-brown appearance and has a somewhat rough surface. The discoloration and roughening of the skin may be confined to the point of contact of the individual fruits at the stalk end of the fruit. It can, however, extend over practically the whole of the surface of the fruit, which may subsequently become badly cracked.

A small amount of rust on a banana does not affect the palatability of the fruit, although it certainly renders its appearance less attractive. In cases where the skin is badly rusted, however, the quality of the fruit is definitely impaired, and large quantities of fruit may be rendered quite unmarketable.

PLATE 29.—BANANA FRUIT SHOWING "RUST" DUE TO THRIPS ATTACK.

Life History and Life Cycle Stages.

The very small eggs of the thrips are laid in the plant tissue, the eggs being deposited therein in punctures made by the adult insect. They are commonly laid on the fruit, particularly at the points of contact between the individual fruits and also under the leaf sheaths. Colonies are most numerous in these two parts of the plant.

The eggs hatch out in about a fortnight, and the white-coloured larvæ emerging therefrom become full grown in a week, being then approximately one twenty-fifth of an inch in length. The full-grown larvæ generally pupate in the soil, but pupation may occur on the plant, and after a pupal period of about a week the delicate yellow-coloured adults emerge. They possess two pairs of narrow-fringed wings, at the base of each of which there is a distinct dark area.

There is not infrequently some uncertainty as to the identity of small insects associated with bananas, and species of insects known as

springtails, most of which are merely scavengers, have been mistaken by growers for the dreaded banana thrips. Should a grower be in any doubt on that point, he should forward specimens to Mr. N. E. H. Caldwell, Assistant to Entomologist, Department of Agriculture and Stock, Nambour, who will be only too pleased to definitely identify the specimens.

Thrips Control Experiments.

Having indicated the nature of the damage and of the insect responsible for it, an outline of what may be done to control this pest can now be given, and from the grower's point of view that is, of course, a vitally important matter.

A very considerable amount of attention has been devoted to the problem of control, and extensive field experiments have been carried out by departmental officers. Indeed, the results of certain large scale experiments in North Queensland have just been published in the "Queensland Agricultural Journal," and it is largely on the results of these experiments that the present control recommendations are based. These recommendations will be found to be very useful, but an effort is being made to still further improve on them. With this object in view the Minister for Agriculture and Stock appointed an officer in June of last year to work full time on the thrips problem, and that officer recently initiated a number of field experiments. The investigator in question, Mr. N. E. H. Caldwell, is a State departmental officer, but his appointment was made possible by a grant from the Commonwealth Banana Committee.

Control Measures.

Where infestation occurs and the thrips is present in large numbers, growers should give serious consideration to dusting the bunches at regular intervals during the warmer months of the year. In the present state of knowledge, the most effective dust to use is a nicotine dust, preferably one in which the nicotine is present as free nicotine, although dusts in which the nicotine is present as nicotine sulphate can also be used with beneficial results.

The dusting should be done at weekly intervals. Ideally the dust could be applied with a rotary duster fitted with a special flexible outlet pipe; dusting can, however, be accomplished by the use of a relatively inexpensive hand dust gun. The latter type is actually in use for the present series of experiments. The exact time of the year at which dusting should commence on any particular plantation must, of course, be left to the discretion of the individual grower. Growers are reminded that caution must be exercised in the application of dusts for, if unnecessarily large quantities are used, an unsightly residual deposit may eventually accumulate on the fruit.

A grower situated in a district in which thrips is known to occur would be well advised to inspect the bunches at regular intervals, and if thrips shows signs of becoming abundant, then, as indicated, dusting the bunches with nicotine dusts is the most promising control measure to adopt.

Obviously, where areas are free from thrips infestation, every effort should be made to keep them so, and it would be manifestly unwise to introduce suckers to such a clean area from one already known to be infested. In this connection it has sometimes been suggested that suckers might be freed from thrips infestation by dipping in nicotine sulphate.

Such dipping cannot, however, be relied upon to completely free the suckers from infestation, although it will undoubtedly reduce the number of thrips associated with the plants.

Each year the Banana Industry Protection Board drafts a planting policy, in which the securing of suckers is discussed. Growers should therefore make themselves acquainted with the current planting policy, particulars of which can be obtained from the local agent of the Board.

Finally, in combating the thrips menace, growers at present will have to rely mainly on dusting the bunches with nicotine dusts in areas where infestation is severe. Where infestation does not occur, every precaution must be taken to maintain these areas free from thrips.

QUEENSLAND SHOW DATES, 1934.

Stanthorpe: 7th and 9th February.
Killarney: 16th and 17th February.
Allora: 7th and 8th March.
Clifton: 14th and 15th March.
Tara: 21st March.
Milmerran: 20th March.
Goombungee: 28th March.
Pittsworth: 4th and 5th April.
Warwick: 10th and 12th April.
Toowoomba: 16th and 19th April.
Rosewood Camp Draft: 7th April.
Goondiwindi: 27th and 28th April.
Oakey: 28th April.
Taroom Camp Draft: 30th April.
Taroom: 1st and 2nd May (Camp Draft, 5th May).
Dalby: 2nd and 3rd May.
Beaudesert: 2nd and 3rd May.
Charleville: 8th and 10th May.
Nanango: 3rd and 4th May.
Blackall: 7th and 9th May.
Chinchilla: 8th and 9th May.
Crow's Nest: 9th and 10th May.
Boonah: 9th and 10th May.
Monto: 9th and 10th May.
Kingaroy: 10th and 11th May.
Ipswich: 15th to 18th May.
Miles: 16th May.
Kilkivan: 16th and 17th May.
Mitchell: 16th and 17th May.
Mundubbera: 16th and 17th May.
Wondai: 17th and 18th May.
Roma: 22nd to 24th May.
Gympie: 23rd and 24th May.
Biggenden: 24th and 25th May.
Murgon: 24th to 26th May.
Toogoolawah: 25th and 26th May.
Kalbar: 26th May.
Goomeri: 29th and 30th May.
Wallumbilla: 30th and 31st May.
Maryborough: 1st, 2nd, and 4th June.
Childers: 5th and 6th June.
Marburg: 1st and 2nd June.
Bundaberg: 7th to 9th June.
Lowood: 8th and 9th June.
Rockhampton: 19th to 23rd June.
Mackay: 26th to 28th June.
Laidley: 27th and 28th June.
Proserpine: 29th and 30th June.
Townsville Camp Draft: 30th June.
Bowen: 4th and 5th July.
Gatton: 4th and 5th July.
Kilcoy: 5th and 6th July.
Townsville: 10th to 12th July.
Woodford: 12th and 13th July.
Rosewood: 13th and 14th July.
Cleveland: 13th and 14th July.
Cairns: 17th to 19th July.
Charters Towers: 18th and 19th July.
Nambour: 18th and 19th July.
Caboolture: 20th July.
Atherton: 24th and 25th July.
Pine Rivers: 27th and 28th July.
Royal National: 6th to 11th August.
Home Hill: 31st August and 1st September.
Imbil: 7th and 8th September.
Ingham: 7th and 8th September.
Beenleigh: 20th and 21st September.
Rocklea: 22nd September.
Malanda: 26th and 27th September.
Kenilworth: 29th September.

Yeasty Rot of Pineapples and Its Control.

By H. K. LEWCOCK, M.Sc., B.Sc. Agr., Pineapple Pathologist.

FOR a number of years, considerable wastage has occurred in Queensland pineapples shipped to the markets of the Southern States through ripe rots which develop during transport and storage. These losses occur chiefly during the summer months, and to a considerable extent are due to the disease variously known as soft rot or water blister. In addition to this disease, however, there is another type of pineapple spoilage—namely, yeasty rot—which under certain conditions may cause considerable damage to fruit which has to be transported long distances. Yeasty rot also occurs under field conditions, and it is in this form only that the disease is known to most growers, who regard it as a minor trouble almost solely restricted to injured or over-ripe fruit. Likewise, fruit merchants and other trade interests have mostly failed to recognise the wastage caused by yeasty rot, as on the Southern markets there appears to be an almost universal tendency to regard all spoilage occurring in pineapples as being due to water blister. That such is not the case, however, is indicated by reports supplied through the courtesy of the Committee of Direction of Fruit Marketing from their Melbourne representative, who has estimated losses from yeasty rot in individual consignments as high as 40 per cent. Through the same organisation arrangements were made for samples of these affected fruit to be returned to Brisbane in aseptic containers for examination; the causal organism of the disease was recovered from two-thirds of the samples so received.

Description of the Disease.

External Symptoms.—A diseased condition of a pineapple affected with yeasty rot is usually not apparent until fermentation of the tissues is well advanced. Normally, the first characteristic signs of the disease are the bubbles of gas and liquid which exude from the injury or crack through which infection occurred. As fermentation progresses the fruit loses weight rapidly, due to the escape of gas and liquid, and the skin becomes leathery in texture and spongy to pressure. Finally, when all the juice has exuded, the fruit is reduced to nothing more than a shell enclosing a mass of fibro-vascular strands. In contrast to soft rot, the skin of fruit affected with yeasty rot does not become thin and brittle, but remains thick and tough. No external discoloration of the skin accompanies the actual fermentation, but in the final stages of the disease secondary rot organisms frequently induce a brown decay.

Internal Symptoms.—The flesh of fruit affected with yeasty rot has a somewhat stringy or fibrous appearance, and is ruptured and torn with large air-filled cavities extending from just below the skin almost to the core. These cavities are caused by exudation of fermenting juice. Affected tissues are canary-yellow in colour, in marked contrast to the light straw-coloured flesh of sound fruit.

The Causal Agent and Mode of Infection.

As its name implies, yeasty rot is a fermentation disease caused by various species of yeasts (*Saccharomyces*). As is the case with many other fruits, species of yeast occur normally on the surfaces of ripening pineapples. Experimental studies have shown, however, that infection

occurs only through injuries or growth cracks which rupture the skin of the fruit. The yeasts themselves are unable otherwise to penetrate this protective covering. Unlike the soft rot disease, yeasty rot infection has not been observed to take place through the cut end of the stalk.

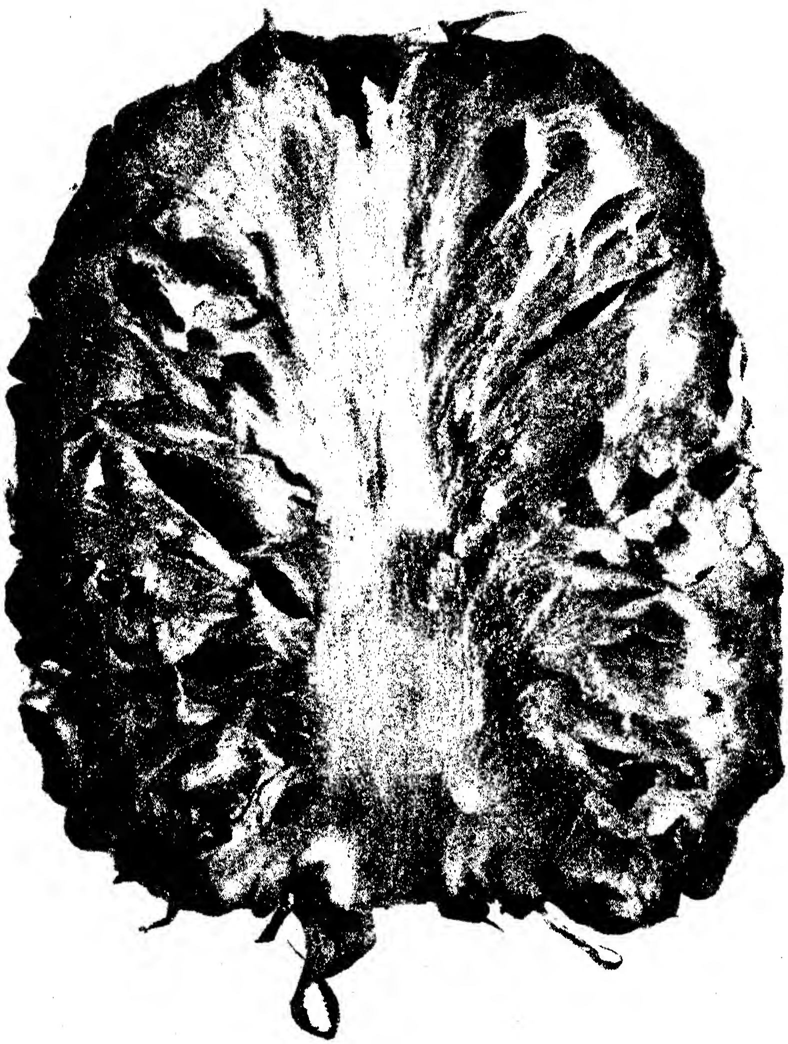


PLATE 30.—YEASTY ROT OF PINEAPPLE (INTERNAL VIEW).

Factors Influencing Infection.

Maturity of the Fruit.—Ripeness of the flesh, irrespective of the degree of skin coloration, is a prerequisite to infection. This may occur before the fruit is picked or after picking and while the fruit is in transit to the market.

Temperature.—Like water blister, the development of yeasty rot is favoured by high temperature conditions and inhibited by low temperatures. During the warmer months of the year, yeast infection occurring through injuries inflicted in ripe fruits by mice, birds, &c., leads to a rapid fermentation of such fruit under field conditions. In such cases, however, the disease causes no material loss. High temperature conditions obtaining during transportation of fruit to the Southern markets constitute a more serious matter. The carriage of fruit to Melbourne by rail occupies a period of four days, and should this take place during hot, sultry weather, the normally unfavourable temperature conditions of the confined van space are accentuated by retarded ventilation and the heat given off by the fruit during respiration. Under such circumstances, yeasty rot may cause heavy loss before the fruit arrives on the market, unless precautions have been taken during packing to minimise the possibility of infection.

Rainfall.—Although economic losses from yeasty rot occur chiefly in connection with the shipping of pineapples to the Southern markets during the summer months, spoilage occurs in such an irregular manner that its development is obviously determined by some inciting influence other than high temperature. It has been found that incidence of rainfall during the growth of the fruit is the chief factor which indirectly limits the development of yeasty rot in pineapples during transport. A protracted period of dry weather during the summer growing season results in the fruit becoming "skin bound" as they approach maturity. Should heavy rains occur at or about the time the fruit is ripening, sudden swelling of the tissues takes place, resulting in the development of minute cracks and fissures in the tightly bound skin. It is through growth cracks arising in this manner that the yeasty rot organism gains entry to sound, marketable fruit. Weather conditions such as those outlined above obtained fairly generally during the summers of both 1932 and 1933 and, consequently, heavy losses from yeasty rot occurred in many interstate shipments of pineapples made in these years. In seasons of normal rainfall, however, the disease does not appear to be of very great importance.

Control Measures.

The percentage of marketable fruits affected under field conditions is seldom high enough to cause appreciable wastage and, consequently, the need for controlling losses from this form of the disease rarely arises. It is only during the transport of fruit to distant markets that losses from yeasty rot are of economic importance. Such losses may be rendered negligible or entirely avoided if—in addition to the careful handling customarily given to fruit intended for interstate markets—the following precautions are observed at times when the disease is likely to occur:—

(1) When packing for distant markets, discard all fruits showing abrasions or recent growth cracks, the presence of which is usually indicated by exuding juice. Ordinarily, such fruits are quite acceptable for cannery purposes if processed without delay, or they may be disposed of through any other local outlet which will permit them to pass into consumption quickly.

(2) Avoid packing fruit while still wet from rain or dew, and use only packing material which is thoroughly dry.

(3) Practice strict sanitation both in the field and in the packing shed. Damaged or diseased fruit should not be left to decay in the plantation or thrown into a heap near the packing shed, but should either be buried or removed to low-lying waste land where they are not likely to prove a source of infection.

COLD STORAGE OF TOMATOES.

How far is it practicable to hold tomatoes in cold storage, in order that temporary gluts may be relieved and better average returns ensured? The genesis of recent investigations in this connection, states the "Agricultural Gazette" of New South Wales, was the mention by Messrs. Granger Bros., of Narrandera, in a letter to the Department of Agriculture, of the fact that tomatoes if picked green would keep up to two months in their district at an average temperature of 50 deg. Fahr. (natural temperature), the fruit gradually ripening during storage. They suggested that perhaps it would keep for several months at a lower temperature in a cool store. Subsequently they forwarded four cases of Bonny Best tomatoes to the Sydney Municipal Cold Storage Works for trial.

The tomatoes were very green when stored; no special attention was given to the method of packing, the cases being merely lined with paper. The storage temperature was about 34 deg. Fahr. For the first three weeks no alteration was noticed in the colour or appearance of the tomatoes, and when cut open they appeared the same as when placed in store. At the end of four weeks a slight shrivelling of the skin, especially around the stalk, was noticed, and the colour, if anything, was not as green as before. After the sixth week the fruit broke down completely, spots of mildew appeared around the stalk and anywhere on the skin where there were any blemishes, the colour changed to a yellow-green, and the fruit took on a distinct waxy or glassy appearance.

Apparently three to four weeks would be the limit of cool storage for this variety of tomato under the conditions observed above, as from this time the fruit very quickly deteriorated, and it is very doubtful if it could be taken from store and ripened before it broke down completely.

In the report of the Food Investigation Board for 1927 (England), it is stated that tomatoes kept at a temperature of 34 deg. Fahr. for four days or less ripened normally at ordinary temperature and showed a rate of wastage no greater than that of tomatoes which had not been exposed to a low temperature. If, however, the period during which the tomatoes were kept at 34 deg. Fahr. was increased to six or more days the fruit failed to ripen normally after removal from storage and an unusually rapid wastage occurred. It also stated that tomatoes are injuriously affected by storage for more than a short time at temperatures below 50 deg. Fahr.

The injurious effects of storage at 34 deg. Fahr. is not reflected in rate of wastage while the fruit is kept at that temperature, but becomes apparent after removal to higher temperature. Storage at this low temperature would only be of value if consumption occurred before fungal rotting commenced, which may begin within twenty-four hours after removal from storage.

In a more recent publication—viz., "Tropical Agriculture" (B.W.I.), Vol. X., No. 6—Wardlaw and McGuire state that they found that tomatoes picked full grown but green could be successfully held in cold storage at 47.5 deg. Fahr. for periods up to twenty days, and thereafter ripened and held at 70 deg. Fahr. for ten to fourteen days without undue wastage. Fruit that had escaped fungal infection did not undergo deterioration on removal from cold store.

Barn Spot of Tobacco.

PRELIMINARY INVESTIGATIONS AND FLUE-CURING EXPERIMENTS.

By L. F. MANDELSON, B.Sc. Agr., Assistant Plant Pathologist.

FROG eye leaf spot and barn spot of tobacco are both the result of infection by the parasitic fungus *Cercospora nicotianæ*. The former blemish develops in the field, whereas the latter develops during curing, and is most pronounced at about 110° F. when the leaf is drying out. The various field aspects of this disease have been fully discussed elsewhere in this Journal.[4]

Frequently tobacco leaf is considerably damaged during curing through the development of barn spot, even when the amount of frog eye in the field is not very great. Hence it was realised that any modification of the curing process which would retard the development of barn spot would be of considerable economic importance. Consequently the nature of barn spot and the effect of variations of temperature and relative humidity upon the growth of the causal fungus and on the development of spots have been studied, with the ultimate object of lessening the development of the trouble during curing by a variation of curing practice The results of this work form the subject of the present article

Effect of High Temperatures Prior to Curing.

It has been reported that in some countries barn spotting is more or less controlled by subjecting tobacco leaf to fairly high temperatures prior to curing. Hopkins[2] states that some growers in Rhodesia run the temperature in the barns up to 160° F. as quickly as possible, and then rake out the fires and allow the barns to cool to the normal temperature prior to proceeding with curing in the usual way. Similarly, Butler[1] reports that in Nyasaland the extension of spots during curing is checked by raising the temperature of the barn for a time to 120° F. or more. He suggests that this method "probably acts rather by killing the leaf tissue than by injuring the fungus, which the temperatures reached would be quite unlikely to do." The development of the parasitic fungus is consequently checked, since it does not readily grow on dead materials.

In June, 1932, experiments were carried out in the Mareeba district by Mr N. E. Goodchild, Instructor in Agriculture, at the suggestion of the writer, to test out this method.

In these experiments, two barns were used. One was kept at low temperatures and high humidity for the purpose of colouring the leaf, and the other was used for preliminary heating of the leaf prior to colouring. The temperature of the latter was first raised to 120° F. at the rate of one degree per minute. Sticks of leaf were exposed to this and higher temperatures up to 160° F. for various periods of time. After treatment the leaf was transferred to the colouring barn and coloured in the usual manner. For comparative purposes, some leaf was placed directly into the colouring barn without preliminary heating.

In the first experiment the temperatures used were 120° F., 130° F., 140° F., 150° F., and 160° F., and the periods of exposure varied from five to fifty minutes. It was found that the control leaf showed larger

and more numerous spots than that which had been subjected to a preliminary heating. The latter, however, was mostly scorched, and spotting developed to some extent.

In the second experiment efforts were made to raise the temperature more rapidly, to observe the effect of times of exposure other than those employed in the previous experiment, and also to confirm the results already obtained.

The greatest speed by which the temperature could be raised was 3° F. per minute The same temperatures were used as above, and the period of exposure varied from one to twenty minutes.

It was found that five minutes' exposure at 130° F. gave rather good control, although the tips of the leaves were scorched. Ten minutes at this temperature was definitely too long, since the exposed portions of leaves were damaged. Scorching occurred at and above 140° F. when exposed for only three minutes or less.

From these experiments it was concluded that barn spotting could be controlled to some extent by this method, but that the danger of ruining the leaf by over-heating was too great to warrant its recommendation as a general control measure.

The following season further curing experiments along different lines were carried out. The principles involved were based upon the results of laboratory investigations. These studies and the subsequent curing experiments are discussed herein in some detail. It must be remembered, however, that the following is a progress report of preliminary work and that further investigations are contemplated.

LABORATORY EXPERIMENTS.

The two main factors involved in flue curing of tobacco are temperature and humidity, and both these factors may be controlled during the process. Hence laboratory experiments were designed to study the effect of variations of temperature and humidity on the growth of the fungus, which is the cause of frog eye, and on the development of spots on affected leaf tissue.

Temperature Reactions of C. nicotianae and Their Possible Significance in Spot Development.

Single spores of the fungus *Cercospora nicotianæ* were isolated from frog eye spots on tobacco leaves, and were grown on potato dextrose agar medium for the purpose of these investigations. Cultures obtained in this manner were incubated in fourteen compartments of a multiple temperature incubator at temperatures ranging from 5° C. to 37·5° C., at intervals of about 2° C. It was observed that the appearance of the fungus varied greatly at different temperatures. Striking differences were noted in the colour of the fungus, the nature of its growth, and the formation of vivid coloured zones.

Since temperature can be responsible for such variations when the fungus is grown on artificial medium, it seems quite likely that it would also cause variations in colour when the fungus is growing within a tobacco leaf.

Barn spots are usually brown, but at times they may be a greenish-black. Butler[1] has suggested that this unusual form may be "due to the special conditions of temperature and the like in the barns."

Furthermore, Hopkins[3] has recently reported that in Rhodesia the symptoms of frog eye leaf spot, which developed in the field in 1933, were abnormal, and attributes this phenomenon to "unfavourable weather conditions with which the crop had to contend." Similar variations of symptoms have at times been observed in Queensland. The above observations tend to support the possibility that temperature is at least one factor which may cause variations in the colour of leaf spots.

The effect of temperature on the growth of the fungus is graphically illustrated in Plate 31.

These temperature studies have indicated that *C. nicotianæ* will not grow on potato dextrose agar media at temperatures below approximately 7·5° C. (45·5° F.) or above 34° C. (93° F.), and that the optimum temperature for its development is about 26° C. (78·8° F.).

The upper limit of temperatures for growth (i.e., 93° F.) is particularly significant in an investigation of the development of barn spot during curing. Spotting has been observed to occur during flue curing when the temperature at the lower tier in the barn did not fall below 95° F. Nevertheless, under the conditions of the experiment reported above, the fungus which is the cause of this disease does not grow on artificial media at temperatures even slightly lower than 95° F. Possibly the temperature within the tissue of tobacco leaf in a barn differs from that of the surrounding air, or other conditions within the barn are such as may allow growth of the fungus at temperatures apparently above the maximum limit, and this may subsequently result in the development of barn spots.

On the other hand, it is likely that the fungus does not actually grow at all during the curing process. Spotting probably is due to infection which has occurred in the field, although development then has not advanced sufficiently to produce a spot which is clearly visible to the naked eye. Such tissue which has already been affected by the parasite may turn brown when the cells of the normal tissue are colouring and the leaf is being dried; consequently barn spotting would become apparent during this period.

Relative Humidity and the Development of Barn Spot.

In these experiments the relative humidity of an atmosphere was regulated by exposing a surface of distilled water or of various mixtures of water and sulphuric acid within a closed vessel, which contained the leaf tissue or culture being studied.

The effect of various relative humidities obtained in this manner on the growth of the fungus was first investigated. Cultures of *C. nicotianæ* were grown at a constant temperature in atmospheres which varied from 85 per cent. humidity to 100 per cent. humidity, but no significant difference in the rate of growth was observed.

Subsequently the development of barn spot lesions on tobacco leaf tissue was similarly studied.

Tobacco leaf, at various stages of maturity, showing frog eye lesions was obtained from the Sarina district. On arrival at Brisbane the leaf was cut into 4-inch squares, and the number of diseased spots in each square counted, and the limits of several marked with Indian ink.

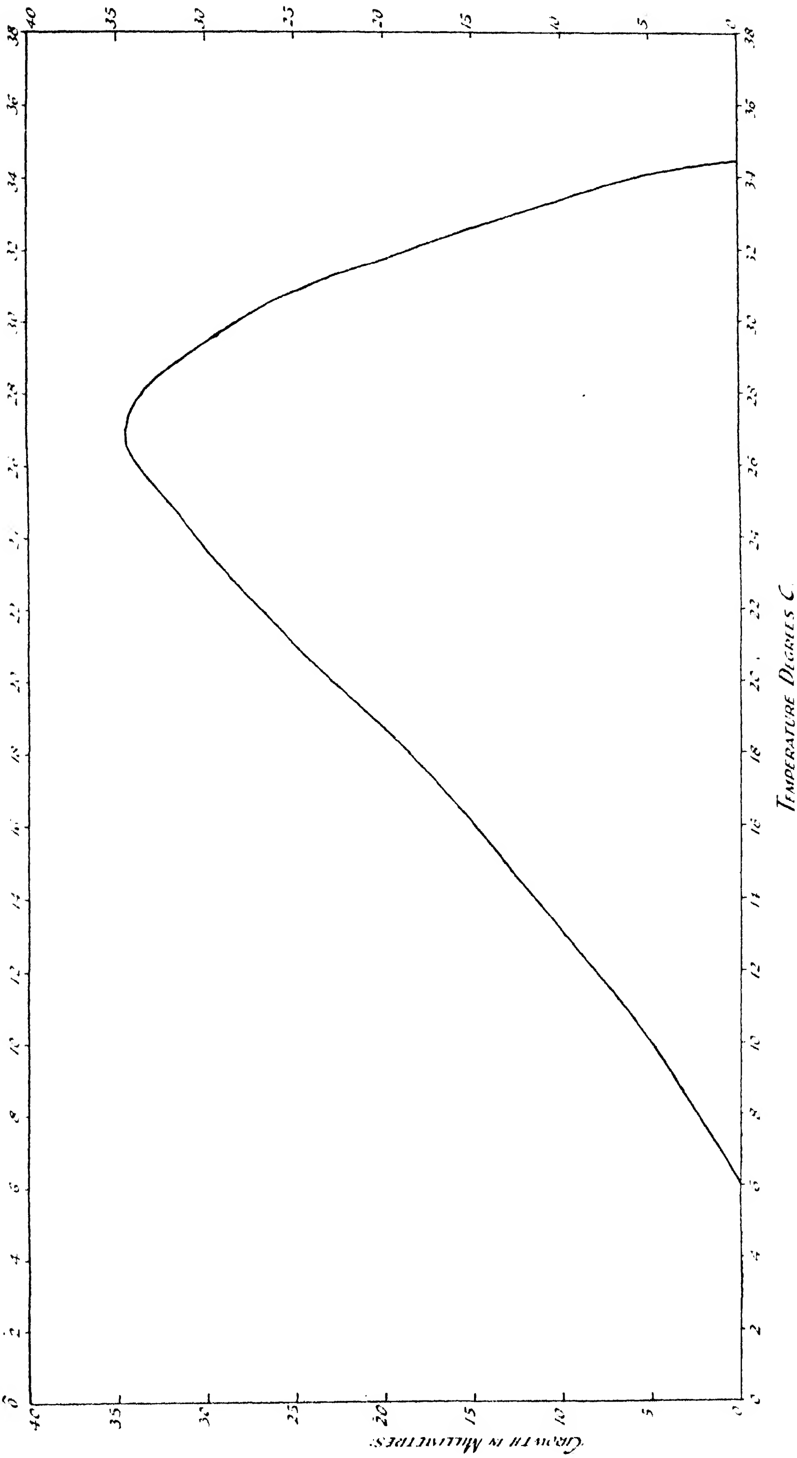


Plate 31.

Growth-temperature curve for *C. nicotianæ* after nine days' incubation. Averaged from data obtained from two series of experiments.

The leaf tissue was suspended in paper saddles in jars containing atmospheres adjusted to the required humidities. The relative humidities used were approximately 60, 70, 80, 90, and 100 per cent. The jars and leaf were placed in an incubator at 43° C. (109° F.).

The leaf was examined after forty hours. It was then found that fairly extensive development of spots had occurred at all humidities with over-mature leaf. Some spots had coalesced, and large brown areas had developed, which made the actual measurement of the extensions of spots difficult.

With less mature leaf it was found that the rate of development of the spots varied at different humidities. The average increases in diameter of the spots measured were as follows:—

At a relative humidity of 60 per cent. the increase was 3·0 mm.

At a relative humidity of 70 per cent. the increase was 3·5 mm.

At a relative humidity of 80 per cent. the increase was 3·0 mm.

At a relative humidity of 90 per cent. the increase was 4·7 mm.

At a relative humidity of 95 per cent. the increase was 5·4 mm.

At a relative humidity of 100 per cent. the increase was 4·1 mm.

It will be noted that a development occurred in all cases, but this development was greatest when the relative humidity exceeded 80 per cent The development in a saturated atmosphere, however, was less than that at 90 per cent. relative humidity. The relative humidity of the atmosphere in a curing barn varies from about 86 per cent. to 96 per cent. during the early stages of curing; consequently these observations suggested that further investigation into the development of barn spotting at high relative humidity might be of practical importance.

At a later date, further leaf from the same source was obtained, and the experiment was repeated. The humidities used were 60, 80, 90, and 100 per cent. On this occasion, however, the leaf was incubated at a temperature of 34° C. (93° F.), since this more closely approximates the temperatures which obtain during the early stages of curing.

The leaf was examined after seventy-five hours, and it was found that the average extension of about thirty spots in each series was as follows:-

At a relative humidity of 60 per cent. the increase was nil

At a relative humidity of 80 per cent. the increase was 0.5 mm.

At a relative humidity of 90 per cent. the increase was 1·2 mm.

At a relative humidity of 100 per cent. the increase was 0·3 mm.

In this case the development at 90 per cent. relative humidity was four times as great as that which occurred in a saturated atmosphere.

Discussion.

No great degree of exactness can be expected in experiments of this nature, since firstly the leaf material used varied in amount of infection and age, and secondly a considerable period elapsed from the time the leaf was harvested until it arrived in Brisbane. Nevertheless, the results indicated that (1) the more mature the tissue the more liable it was to the development of barn spots; (2) this development varied directly up

to a certain point with the relative humidity of the atmosphere in which the leaf was coloured; and (3) the greatest development of spotting occurred when the relative humidity of the atmosphere was at some point between 90 and 100 per cent., but decreased as the relative humidity approached saturation point.

The results of this preliminary work were encouraging, since they indicated that high relative humidity might to some extent check spot development. From the practical viewpoint this was important, since control methods involving a variation of relative humidity during curing would probably be less apt to cause injury to the leaf than one depending on extremely high temperatures.

FLUE-CURING EXPERIMENTS FOR THE CONTROL OF BARN SPOT.

During the past season, at the suggestion of Mr. J. H. Simmonds, Plant Pathologist, flue-curing experiments were carried out in the Sarina district in order to test the significance of the results which had been obtained from the preliminary laboratory experiments reported above. These experiments were made in conjunction with other duties, and consequently the time available was limited. Hence in these experiments, in order to rapidly test the available data, both temperature and humidity were appropriately regulated. Even so, it was only possible to carry out two series of experiments. Since some rather promising results were obtained, they will be discussed herein in detail.

As the conclusions are based on somewhat limited data, it will be necessary, however, to confirm these results during the coming season.

First Curing Experiment.

Since laboratory experiments had indicated (1) that the maximum temperature for growth of *Cercospora nicotianæ* in culture was in the region of 93° F., and (2) that the development of spots on tobacco leaf tissue was restricted in a saturated atmosphere, efforts were made during this experiment to colour the leaf at a temperature range above 95° F., and also to maintain as high a relative humidity as possible within the barn during this period.

Through the courtesy of Messrs. Gerry and Brooks, of Sarina, two of their 12 feet by 12 feet flue-curing barns and the required amount of harvested tobacco leaf were made available for the experiment. Useful advice and practical co-operation were rendered by Mr. C. S. Clydesdale, Senior Instructor in Agriculture, during the curing of these barns, and his efforts were greatly appreciated.

Since it was anticipated that "sponging," a blemish associated with variations in humidity during curing, might develop with leaf cured in an abnormally high relative humidity, the barns were not overloaded with leaf. Only five tiers were used, and the sticks were spaced so that no more than twelve sticks of leaf were hung in each row. Other precautions were also taken at the end of the yellowing period to avoid the development of this trouble.

The barns were filled with leaf by about 5 p.m. on 5th May, and curing operations commenced at 9 p.m.

The leaf in one barn (the control barn) was cured in the usual manner for comparative purposes, and that in the other was subjected to the high temperatures and relative humidity discussed above.

Details of Relative Humidity and Temperature.

In order to increase the relative humidity of the atmosphere within the experimental barn, steam was generated in a 40-gallon iron drum and led into a tub of water in the barn. Wet bags were also periodically placed on the hot flue pipes in the barn. In this manner it was hoped to colour the leaf in an actually saturated atmosphere. It was found impossible, however, to maintain saturation with the facilities available.

A 100 per cent. relative humidity was obtained in this barn during the first half hour and also on two other occasions during the first twelve hours, but could not be maintained for any length of time. The relative humidity exceeded 95 per cent. for only one and a-quarter hours during this period.

That of the control barn did not exceed 92 per cent. during the first twelve hours, and was slightly lower on the average.

For the remainder of the colouring period efforts to maintain a saturated atmosphere in the experimental barn were more successful.

During the same period the relative humidity of the control barn did not exceed 96 per cent., and exceeded 93 per cent. for only two hours, which was about 9 per cent. of the time under discussion.

While the leaf was colouring the temperature of the experimental barn fluctuated between 94° F. and 103° F., whereas that of the control barn varied between 85° F. and 96° F.

The temperatures and relative humidities which were recorded in these two barns during this period are shown by the graph in Plate 32.

Operations Subsequent to Curing.

The ventilators of the experimental barn were opened twenty-eight and a-half hours after curing commenced, whereas those of the control barn were cracked after thirty-three hours. Hence the higher relative humidity and temperature of the former apparently accelerated the colouring process by about five hours.

The moisture in the experimental barn was expelled as rapidly as possible at the termination of the colouring process, as a precaution against the development of "sponging." At Mr. C. S. Clydesdale's suggestion, when the leaf was sufficiently coloured the temperature was rapidly raised 5° F., the top ventilators were opened wide and the lower ventilators were half opened for forty-five minutes. Consequently, the relative humidity was lowered from 96 per cent. to 51 per cent. during the first four minutes, and eventually to 49 per cent. At the termination of this period the top ventilators were closed to a third and the bottom ventilators to a quarter, and the curing was continued in the usual manner.

Observations on Barn Spot Development.

Barn spotting was observed to develop in both barns after about twelve hours' curing, and subsequently increased in severity, and was very obvious seven hours after the ventilators were opened. During the first twenty-four hours, however, spotting did not appear to be so severe in the experimental barn as in the control barn.

At the termination of the experiment there was no marked difference in the amount of spotting which had developed on the leaf from either barn. Nevertheless, it was considered, after a careful examination, that the leaf from the experimental barn was slightly less spotted than that

FIRST CURING EXPERIMENT

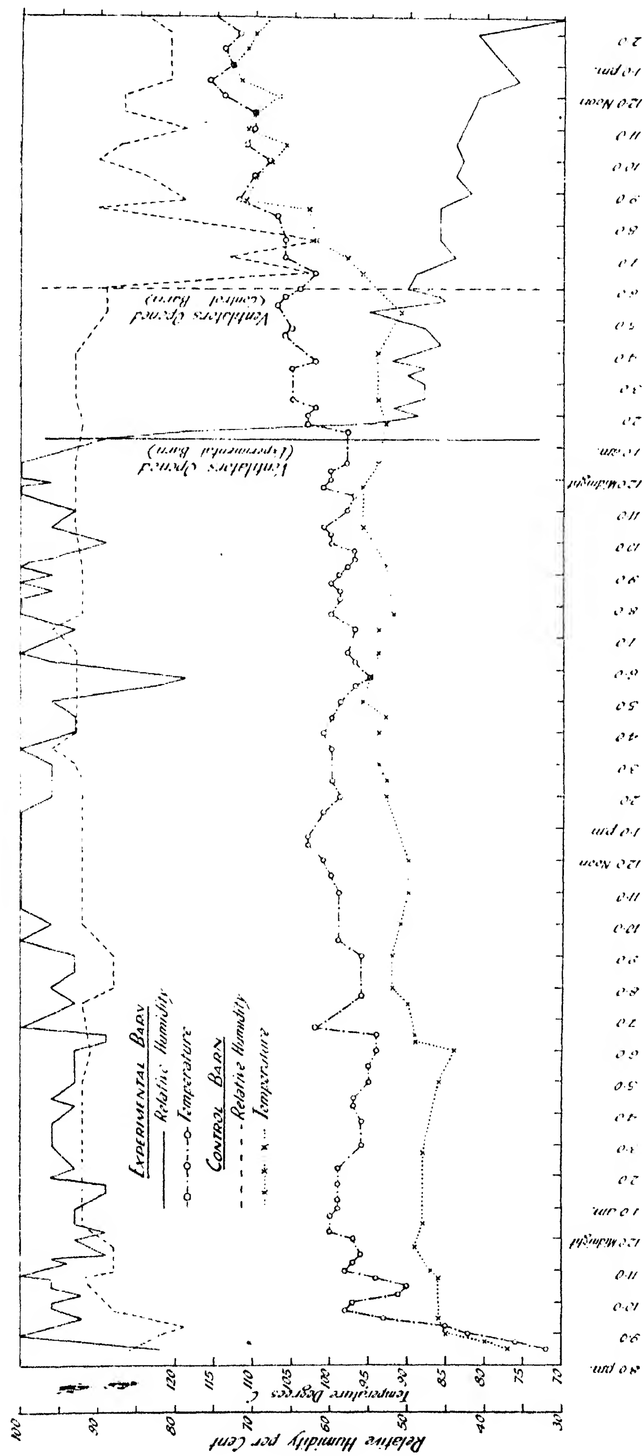


PLATE 32.

First curing experiment. Graph showing relative humidity and temperature records obtained in both the experimental and control barns during the period when leaf was colouring.

from the control barn, and the colour of the leaf was brighter and showed less "sponging." During the experiment several faults were detected in the construction of the barn, which made it extremely difficult to maintain a high degree of humidity. Consequently, it was considered that in view of the conditions under which the experiment was carried out, the results were slightly promising, and warranted the repetition of the experiment.

Second Curing Experiment.

On 8th June the experiment described above was repeated. Besides one experimental and one control barn, in which careful records of temperature and humidity were made, a third barn of leaf was cured normally at the same time, the final result only in this case being observed. On this occasion special precautions were taken to render the experimental barn as air-tight as possible prior to the commencement of the experiment. The facilities for the generation of steam were the same as employed previously.

The thermometers were suspended from the lower tier, and the leaf hung on this tier was carefully graded and labelled prior to curing. Five grades were recognised -namely, clean leaf, which showed no readily observable spots by reflected light; slight infection, when leaves contained one or two spots; light infection, when four or five spots were noticed; medium infection, when about twenty spots were present, and, finally, heavy infection, when numerous spots were apparent. Some leaf graded in this manner also showed incipient frog-eye lesions as minute spots when viewed by transmitted light.

Details of Relative Humidity and Temperature.

After the first three hours of curing, the temperature of the experimental barn did not fall below 98° F. during the colouring process The maximum temperature reached was 108° F. On the average the temperature for this period was a little over 100° F. The temperature of the control barn varied from 82° F. to 100° F., and on the average was about 10° F. lower than that of the experimental barn.

A saturated atmosphere was obtained on twelve occasions during the first twenty-four hours in the experimental barn, and was maintained for periods up to two and a-half hours. The relative humidity only fell below 90 per cent. on two occasions, and then for periods of less than a quarter of an hour. The relative humidity was either at or above 96 per cent. continuously for fourteen hours during the first twenty-four hours of curing, except for one period of half an hour and another of forty-five minutes. This degree of relative humidity was maintained for ten and a-half hours of the first twelve hours of the experiment.

The relative humidity varied from 85 per cent. to 96 per cent. in the control barn during the first twenty-four hours. It did not exceed 96 per cent., and only maintained that registration for half an hour during this period. It was above 92 per cent. for eleven and a-half hours, and two-thirds of this time was recorded during the first twelve hours of the experiment.

Temperature and relative humidity records for this experiment are illustrated by graphs in Plate 33.

The leaf coloured more rapidly in the experimental barn than in the control barn, and the ventilators of the former were cracked ten hours sooner than those of the latter.

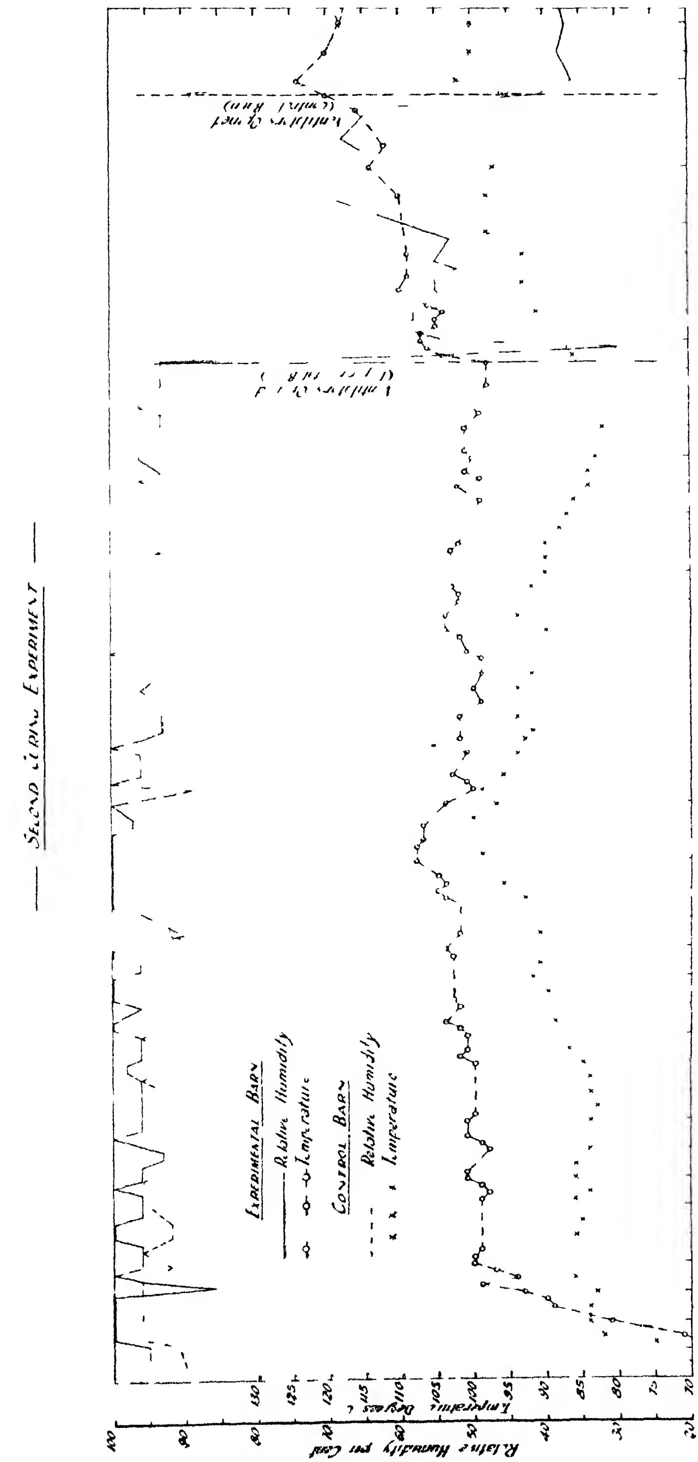


PLATE 33

Second curing experiment. Graph showing data similar to Plate 32. The development of barn spot in the experimental barn in this case was considerably retarded

Although special precautions were taken to make the experimental barn as air-tight as possible, it was found extremely difficult to maintain a sufficiently high percentage of relative humidity with the steam generating apparatus used. It will probably be found necessary in future, therefore, to employ some type of portable boiler for this purpose.

Observations on Barn Spot Development.

As in the previous experiment some barn spot development was observed in both barns after about twelve hours' curing.

When the leaf had been cured, it was found that that from the experimental barn was obviously less spotted, and the spots usually showed less development than leaf from the control barn, or from the third barn in which leaf was also cured in the manner usually practiced. Furthermore, less "sponging" occurred in the experimental barn.

Leaf which was clean, or slightly or lightly spotted prior to curing in the experimental barn developed only a few small spots in some cases, and mostly showed no development (Plate 34). Similar leaf from the control barn was mostly moderately to heavily spotted, although some leaves were unblemished at the termination of the experiment. The latter were probably not affected with the disease when harvested.

Leaf which showed medium infection prior to curing developed more spotting in the control than in the experimental barn. About 70 per cent. of this leaf was finally moderately to heavily spotted in the control barn as compared with about 50 per cent. moderately spotted in the experimental barn.

No great difference could be observed in the final condition of leaf which was heavily spotted prior to curing, although that from the experimental barn was slightly superior.

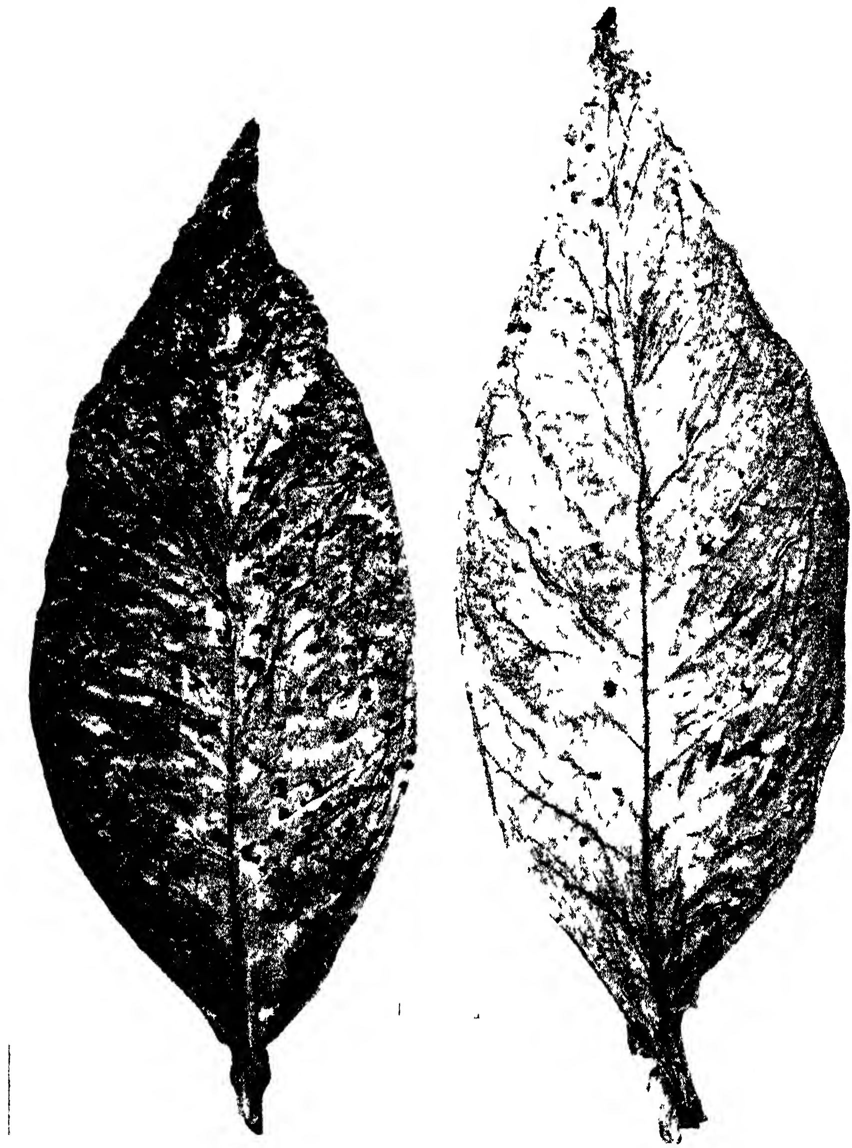
Hence quite a striking improvement was obtained with leaf cured in the experimental barn, which had less than about half a dozen spots apparent prior to curing. With leaf which was originally more heavily spotted the improvement was not so marked. This striking contrast was made possible by the fact that environmental conditions were particularly favourable at the time of the experiment for the development of the disease.

Since the temperature varies considerably at different heights in a barn during curing, a comparison was also made of the amount of spotting which had developed on leaf from various tiers in each barn No obvious difference, however, could be observed in either case.

Discussion of Results of Curing Experiments.

As has been pointed out elsewhere, this work was of a preliminary nature; nevertheless, since the results obtained in the final experiment were rather striking, it is considered that it may be beneficial to analyse that data which is available.

Five important factors were involved in the experiments under discussion - namely, the condition of the leaf used, the rapidity with which the leaf was dried out after colouring, the time taken to colour the leaf, and the temperature and the relative humidity which obtained in the barn during the colouring process.



A. B.

Plate 34

Two tobacco leaves cured during the second curing experiment. Both showed "light" frog eye infection (i.e., four or five spots) prior to curing.

A. Cured leaf from control barn, showing extensive development of barn spot.

B. Cured leaf from experimental barn, showing very little development of barn spot. Leaves which were clean or "slightly" spotted developed even less barn spot in this experiment.

The first is of no importance since similar leaf was used in both control and experimental barns. Furthermore, it is hardly likely that the outstanding results of the second experimental barn were entirely due to the unusual rapidity of drying the leaf after colouring. The temperature of this barn was 130° F. with a relative humidity of 30 per cent. twenty-seven hours after the ventilators were cracked, whereas the control barn reached a temperature of 133° F. with a relative humidity of 26 per cent. in twenty-nine hours—i.e., only two hours longer. Moreover, a graph showing the relative humidity of the two barns illustrates that the slope of that of the control barn is steepest, and hence that during some of this period at least the leaf was drying more rapidly in the control barn than in the experimental barn.

The combination of high humidity and high temperature within the experimental barns certainly accelerated the colouring of the leaf—namely, by four and a-half hours in respect to the control barn in the first, and ten hours in the second experiment. It will be noted, however, that the actual times for colouring were—Test barns twenty-eight and a-half hours and thirty-four hours, control barns thirty-three and forty-four hours, respectively. The longer periods taken in the second series were due to the fact that they were carried out late in the season, when cool weather was being experienced. It would seem from these figures, therefore, that spotting was not avoided in the experimental barns by rapidity in colouring. Although the experimental barn in the second series coloured the leaf ten hours quicker than the control barn, the actual period taken was thirty-four hours, which was in fact one hour longer than the time taken by the control barn in the first series, when considerable barn spotting occurred.

The temperature of the second experimental barn was considerably higher than those of either of the control barns. It was also, on the average, a few degrees higher than the temperature of the first experimental barn, and for a period of one and a-half hours was 7° F. or 8° F. higher. Consequently, since the second experimental barn was much more successful than the first, temperature may have been the limiting factor. Such is hardly likely, however, since during curing the temperature of the top tier may vary by about 10° F. from that of the bottom, and hence a considerable range of temperatures obtains within a barn. It was not possible, with the facilities available, to take temperature readings at various heights during these experiments, but it would be likely that the temperature of the coldest portion of the second experimental barn would be lower than that of the warmest portion of the first experimental barn for a considerable period. Hence if the temperatures reached during these experiments were responsible for the results obtained, then better results would have been observed in some tiers in the first experimental barn, or the amount of spotting would have varied considerably with leaf from different levels in the second experimental barn. Such, however, was not the case.

The most likely reason for the better control of spotting obtained with the second experimental barn was probably the high relative humidity which was maintained when the leaf was colouring, especially during the initial stages of the process. As has been indicated above, the relative humidity of the second experimental barn was either at or above 96 per cent. practically throughout the first twelve hours of curing, whereas that of the first experimental barn only exceeded 95 per cent. for one and a-quarter hours during this period.

The percentages of relative humidity which were recorded in the four barns under discussion for the first twelve hours of curing have been critically analysed, and the total times that the leaf was exposed to various humidities have been grouped together, in each case, and are graphically depicted in Plate 35.

It will be noted that the leaf in the second experimental barn was exposed for much longer periods for all relative humidities in excess of 95 per cent. than that of the first experimental barn, as is illustrated by the difference in the heights of the two columns. The differences are even more striking when the relative humidity of the second experimental barn is contrasted with that of the two control barns for the same period.

It therefore appears reasonable to believe that the difference in relative humidity may have been the main factor responsible for the better results obtained in the second experimental barn.

Further investigations will be carried out to determine the effect of high relative humidities on the development of barn spot Should this prove to be the limiting factor, it will then be desirable to ascertain the minimum percentage of relative humidity permissible in a barn during the colouring process or for any part of it, to most effectively control the development of spotting.

If the results obtained from these proposed experiments are satisfactory, then it should be possible to make definite recommendations for the control of barn spotting by variations of curing methods as practised at present.

Summary.

Barn spot of tobacco is caused by *C. nicotianæ,* and develops during the tobacco-curing process.

When tobacco leaf was heated to about 130° F. the development of barn spot was controlled to some extent, but the danger of ruining the leaf by over-heating was too great to warrant the recommendation of this procedure for general use.

The nature of the growth of *C. nicotianæ* varies considerably when grown on artificial media at different temperatures.

The optimum temperature for its growth on potato dextrose agar was found to be approximately 26° C. (78·8° F.). The minimum and maximum temperatures for growth were 7·5° C. (45·5° F.) and 34° C. (93° F.) respectively.

Since barn spot may develop during the curing process at temperatures greater than 93° F., it is considered likely that barn spot is not the result of growth of *C. nicotianæ* during curing, but is due to the reaction at this time of cells which have been affected by the parasite in the field.

No significant difference was observed in the growth of *C. nicotianæ* on artificial medium when grown in atmospheres of various relative humidities.

It was found that the more mature the tobacco leaf tissue, the more liable it was to the development of barn spot.

Humidity studies indicated that the development of barn spot varied, up to a certain point, directly with the relative humidity of the

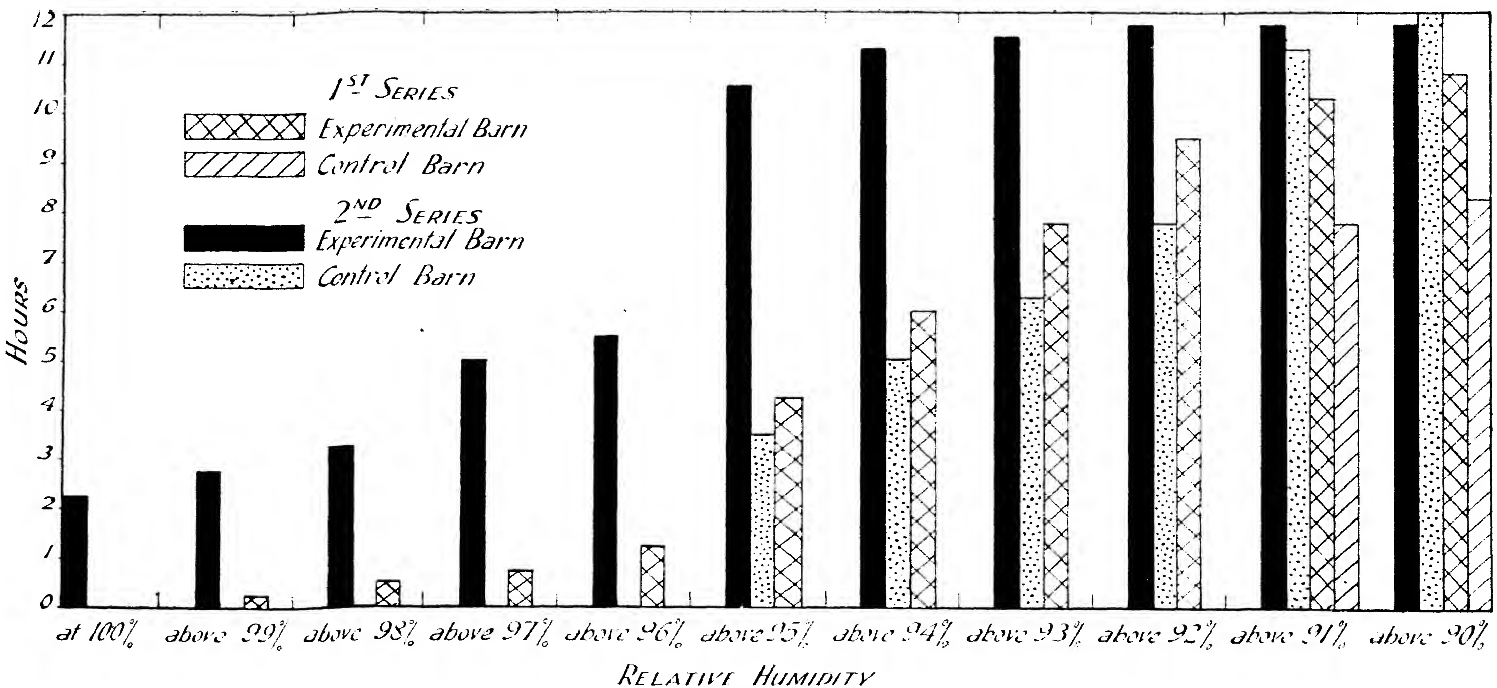


PLATE 35.

Diagram showing the periods for which tobacco leaf was exposed to various humidities during the first twelve hours of the curing experiments.

It will be observed that the relative humidity within the experimental barn in the second series was above 95 per cent. for a much longer period than was the case with the other three barns.

atmosphere in which the leaf is coloured. The development was less in a saturated atmosphere, however, than when the relative humidity was 90 per cent.

Two flue-curing experiments were carried out with commercial curing barns in the Sarina district.

Difficulty was experienced in maintaining a high percentage of relative humidity with the facilities available.

In both experiments the colouring process was considerably accelerated, and the leaf was not adversely affected by the increased humidity and temperature of the barns.

In the second experiment the temperature in the experimental barn varied from 98° F. to 108° F., and the relative humidity of the atmosphere was either at or above 96 per cent. for fourteen hours during the first twenty-four hours of curing.

Leaf cured in this barn developed considerably less barn spot than similar leaf cured in the usual way.

It is considered, tentatively, that the most likely reason for this result was the high relative humidity which was maintained when the leaf was colouring, especially during the initial stages of the process.

It is proposed to carry out further experiments along these lines.

Acknowledgments.

Acknowledgment is made to Mr. J. H. Simmonds, Plant Pathologist, Department of Agriculture and Stock, Queensland, for the active interest shown and useful suggestions made in connection with this work, and to Messrs. Gerry and Brooks, Sarina, for the pathological specimens supplied, and for personal assistance and flue-curing facilities at Sarina.

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The Cultivation of the Peanut.

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Description.

THE Peanut, *Arachis hypogeia,* also known frequently as the earth or ground nut, is a plant of annual habit, belonging to the natural order Leguminoseæ or pod-bearers, and in common with most other members of the pea family has the power of obtaining its nitrogen supply from the atmosphere and storing it up in nodules on the roots.

Unlike other legumes, excepting the Bombarra ground nut, *Voandzeia subterranea,* and one or two others, this plant, while blooming above ground, matures its pod or fruit under the surface of the soil. The yellow flowers are borne at the joints where the leaves are attached to the stem, in the bunch or upright varieties at the base of the plant, and in creeper or procumbent varieties right along the stems. Upon pollination taking place the flower fades, and falling off leaves the stalk with a thickened pointed end called the "peg" or "point," which grows down into the soil, where it matures into the pod or so-called nut. It is apparent from this that the soil on which the crop is grown should be of a soft or friable nature or such that a loose surface can be easily maintained.

Range.

The peanut can be grown over the whole of Queensland, and while in the cooler parts it only succeeds in summer, in the tropical portions it may be grown at any period of the year where a sufficiency of rain falls.

The period of growth ranges according to variety and climate from fifteen to twenty weeks, the longest period being taken up by the creeper or procumbent varieties.

A moderate rainfall, plenty of sunshine, and a comparatively high temperature best suit the crop, and departures from these may result in a more lengthened period of growth. The crop can also be grown under irrigation.

Soils.

The nature of the soil on which the crop is grown, besides its fertility, is the main factor in a profitable crop. A loose texture is desirable to allow the pegs to easily penetrate and expand to form the pods and mature evenly, as well as to permit of easy harvesting in freeing the nuts from the soil. Good drainage is also essential, more especially when a heavy rainfall is liable to occur during the growing period.

Light sandy loams with a good humus content are best adapted for the production of peanuts for sale as whole nuts, since the shells, being clean and bright, are more attractive.

Soils in which the percentage of iron is high and those of clayey nature are apt to produce stained or dirty shells, and though the berries or peas may be of equal or even superior quality, the discoloration is calculated to prejudice sale. When, however, the product is sold in the shelled condition, as to confectioners, this defect is of minor consideration. Ill-drained, heavy clays and soils which become hard and compact should be avoided.

A suitable mechanical character is the first essential in a soil for peanuts, as fertility can be improved by the judicious use of manures and a proper system of cropping.

Depth of Soil.

A soil of a foot or upwards in depth is to be preferred, especially in districts of abundant rainfall, but lesser depths down to 8 inches, provided the subsoil is of a porous nature, will allow of successful production.

Preparation of the Soil.

As the success of the crop is in large measure dependent on the tilth maintained during growth, it is important that the preparation of the soil prior to planting should be thorough.

In the case of virgin soil or land that has been under pasture and where the roots of the preceding crop have not been disturbed, it is desirable to plough a considerable time before sowing is contemplated, in order that any growth ploughed under as well as fibrous roots will have time to decay.

Where this has been effected or a previous crop has left the land clean, a ploughing three or four weeks before the time of planting with an immediate harrowing to create a good tilth and to conserve moisture is desirable. Periodic harrowing during these weeks while further promoting tilth will destroy weeds as they germinate and permit of sowing in a clean seed-bed.

Depth of Ploughing.

As a general rule, the depth of ploughing should not be as great as for potatoes or maize in the same locality. From 5 to 6 inches is regarded as adequate, but deeper ploughings, provided no subsoil is brought to the surface, are not regarded as detrimental.

Fertilizers and Lime.

In common with other legumes, the peanut thrives best in a soil in which there is a sufficiency of lime. Not all soils require the addition of lime, but most soils in districts subject to heavy rainfall, and which give an acid reaction, will benefit by an application of from 5 to 10 cwt. of stone lime or 10 to 20 cwt. of earthy lime or pulverised limestone to the acre, broadcasted (not ploughed in), preferably a week or more before applying commercial fertilizer and sowing the seed. The cultivation of the crop will sufficiently work this lime into the soil. Where any doubt exists as to the necessity of applying lime to the soil, a portion should be limed and the resultant crop compared with a similar area unlimed.

In applying manures for the crop, care should be taken to only apply organic manure in a well-rotted condition, and then only in small quanties and thoroughly mixed with the soil. Larger quantities of fresh manures will result in many of the pods being poorly filled. These poorly-filled pods are known as "pops" or "duds."

Organic manures such as that from the farmyard are better applied for a previous crop. Where growing crops are ploughed in to augment or maintain the supply of humus, it is also better to grow an intervening crop.

The supply of humus in the soil is of great importance to all crops, as not only is the soil mechanically benefited but it preserves a more even temperature and is more retentive of moisture. Bacterial multiplication is also assisted and the supply of plant food improved.

As the peanut is a legume and draws much of its nitrogen from the air this element is not called for in great quantity in the fertilizer, especially when the soil is fairly well supplied with humus and decaying organic matter. On most soils, however, its presence in immediately available form is desirable to allow the plants to become well established.

Phosphoric acid and potash are the chief elements demanded in the fertilizer mixture, of which the rate of application will be determined by the natural fertility of the soil.

An ample supply of phosphates in the soil stimulates root development and causes the crop to mature more rapidly and evenly. It is also necessary to allow the nitrogen-fixing bacteria to assume the motile form and thus to become capable of invading the young roots.

On loamy soils, such as those in which maize and potatoes return profitable crops, the necessity for applications of fertilizer is not urgent, yet a supply in small quantity can be calculated to induce a greater profit. On such soils, however, the fertilizer should containly only a small percentage of nitregen, and this in a readily available form.

A mixture of 10 lb. nitrate of soda or sulphate of ammonia, 70 lb. high-grade superphosphate, and 20 lb. sulphate of potash for each 100 lb. would be considered suitable. This mixture would contain 1·5 per cent. nitrogen if nitrate of soda was used, or 2 per cent. nitrogen if sulphate of ammonia was used; the percentage of phosphoric acid would be 14·35 and that of potash approximately 10. Such a formula might be expressed as 2-14-10.

On poorer soils, and especially those of sandy character, recommended for the production of bright tobacco, in which the humus content is generally low, the application of a fertilizer carrying a somewhat higher percentage of nitrogen is desirable.

On sandy loams a mixture of 20 lb. sulphate of ammonia, 60 lb. high-grade superphosphate, and 20 lb. sulphate of potash would be suggested.

On sandy soils a mixture of 15 lb. dried blood, 13 lb. nitrate of soda, 60 lb. high-grade superphosphate, and 12 lb. sulphate of potash would be more advisable, as the organic matter of the dried blood would be of assistance and its nitrogen content become readily available when the nitrate was exhausted. This latter mixture is the popular 4-12-6 tobacco mixture. The former would be expressed as 4-12-10 and the first named as 2-14-10, the numerals in their order representing percentages of nitrogen, phosphoric acid, and potash respectively.

When the drills are 3 feet apart, a collective length of 220 chains constitutes an acre, and when 2 feet 6 inches apart such collective length would be 264 chains.

Dressings of fertilizer from half a pound per chain at the rate of 110 lb. and 132 lb. respectively per acre would be suggested on a fairly fertile sandy loam, up to 2 lb. per chain or 440 lb. and 528 lb. respectively on a poor sandy soil. Generally, however, a dressing of 1 lb. per chain of drill should be ample.

On certain fertile soils applications of superphosphate only at the rate of half a pound per chain of drill might be sufficient.

Commercial fertilizers are usually applied immediately prior to planting a crop, and as the roots of the peanut do not spread to any distance, the application in the drill with a fertilizer distributor having one or two tines at the back will greatly aid in mixing the fertilizer with the soil.

Ashes from the forest hardwoods, which contain lime and potash, are useful, and may be applied to the soil broadcast in a similar manner to lime at the rate of about 10 cwt. to the acre. These ashes, however, should not previously have been exposed to rain, as then a great deal of their value will have been lost. The ashes of soft woods growing in the scrubs are not considered so good.

Selection of Seed.

As with other crops, in order to secure the best results it is essential that the seed of the peanut should be of the highest grade. Poor seed cannot be expected to yield a good return. In the first planting, seed should be secured from a heavy producing crop and subsequently carefully selected in the field from the heaviest producing plants of the required type. A good plan is to select the nuts from the best producing plants and sow these in a special seed patch, each year selecting the best of this area for next year's seed patch. Nuts harvested for seed should be fully matured, handled carefully, and not picked from the plants for several weeks after curing; they should then be picked by hand and the selected ones thoroughly dried and stored in a dry place free from mice or insect attack. Storage in tanks in a similar manner to maize is most satisfactory.

Quantity of Seed.

The quantity of seed required to plant an acre is about 40 lb. of the whole nuts and from 25 to 30 lb. of whole nuts shelled, varying slightly according to the weight of the nut and the distance apart they are planted. Some growers use as much as 60 lb. per acre of the large podded varieties. It is interesting to note that the whole nut, when planted, provides but one plant, but if shelled and the kernels planted apart, two plants will result.

Time of Sowing.

According to the climates of the various districts, so will the time for planting vary.

In the cooler districts, sowings may be made when all danger of frosts is over and the soil can be expected to be reasonably warm, September, October, November, and December being suitable months. In the tropics the crop can be grown practically throughout the year, but consideration must be given to climate and rainfall—i.e., sufficient rainfall should be obtained to grow the crop and fine weather be expected at harvest time.

In the tropical portions of the State, where the monsoonal rain or wet season commences in December, the main crop is sown in January, February, and March, according to the likelihood of reasonably fine weather in the months of April, May, and June or July, when harvesting should occur.

In planting large areas it is recommended to spread the sowings over such a time as will allow of harvesting one lot before the next is over-ripe. Peanuts left too long in the ground are easily detached from the plant and consequently more difficult to harvest, while some varieties are liable to sprout.

Length of Crop.

The large nuts or creeper varieties require a longer time for growth to maturity than do the bunch or upright varieties, the time varying from fifteen to seventeen weeks for the bunch varieties and from seventeen to twenty weeks frequently for the creeper variety.

PLATE 36.
Peanuts at Warren, Central Queensland.

Method of Planting.

The land having been ploughed and brought to a fine tilth should be given a harrowing immediately prior to planting to destroy any weeds or their germinating seeds.

In general, drills are drawn out from 30 inches to 42 inches apart, the distance being influenced by the space required for the cultivating implement available.

Where no seed drill or fertilizer distributor is obtainable, the drills could be drawn out with a plough or a cultivator having a wide shovel attachment in the rear, the fertilizer dusted along this by hand, the cultivator then run along the drill with tines set close in front to mix the fertilizer with the soil, and the shovel attachment set at the back to reopen the drill for the reception of the seed to be dropped by hand; this drill should not be deeper than 4 inches from the levelled surface of the soil, and the seed should be covered to a depth of 2 to 3 inches,

according to the texture of the soil and its moisture content. In light soils where evaporation is great the deeper planting is preferable, but in stiffer soils the shallower covering should be adopted.

A light firming of the soil over the seed is desirable, and this is obtained in the seed drill by a wheel at the rear. When planted by hand the area may be covered with the harrow, or preferably by the cultivator, with tines straddling the drill and set so as to throw the soil inwards.

Most corn planters can be supplied with plates or other devices specially adapted for sowing either whole or shelled nuts.

The seed can either be planted whole or shelled. Whole nuts may be soaked in cold water twelve to twenty-four hours, drained, dried for an hour or two to assist handling, and then planted. This accelerates germination. Shelled seed should not be soaked.

Where shelled seed is used the shelling should be done by hand, though hand shellers carefully worked are sometimes used. All shelled seed in which the thin skin covering the seed is broken should not be sown, as this injury is liable to affect germination.

Breaking the pods in two answers the same purpose as shelling. Where the seed after planting may be subject to attack by vermin, the seed may be treated by sprinkling with a solution of equal parts of stockholm tar and kerosene. In this case, however, to protect the maturing crop it is advisable to destroy, by poisoning, the vermin beforehand.

Spacing.

The intervals between drills and the spacings between seeds in the drills vary somewhat, according to the richness of the soil and the variety planted.

The bunch or upright varieties take up much less room than the creeper or procumbent kinds, and the growth of both is correspondingly greater on the richer soil.

The spacing of the seed in the bunch varieties may be from 6 to 12 inches apart, and of the creeper varieties from 12 to 24 inches apart in the drill. An instance of success with close planting is noted from an experiment in which, in a light sandy loam, the bunch varieties were planted 3 inches apart in drills 30 inches wide. It is thought, however, in richer soils this crowding of the plants would be detrimental.

Time of Germination.

Germination usually occurs with shelled nuts in five days, but is subject to the amount of moisture and heat in the soil. The whole nuts take longer unless first soaked in water, as the moisture has to penetrate the shell to affect the berry or pea which contains the germ.

Cultivation.

Where close planting has been adopted the land may be harrowed with a light harrow shortly after the plants appear through the surface. Otherwise it will be better to use the cultivator between the rows and the hand hoe, where necessary, between the plants. The first one or two cultivations should be done with fine points, as in the strawberry cultivator or the 1¼-inch or narrowest shovel points supplied with the usual 5-tooth cultivator; after this the broader points can be used and

later the hilling attachments. In early cultivations the cultivator can work close to the roots, but not deeper than 2 inches; but later, after flowering, when the pegs enter the soil care should be taken that the plant is not disturbed.

In most soils it is desirable to draw a little of the soil in towards the plant to provide a bed of fine earth in which later the pods may form, and this can be done at each cultivation, finally leaving a flat bed in which the plants are growing with a water furrow between each drill. The height to which hilling may be practised depends largely on the soil. Usually, the heavier the soil the more necessity for hilling.

Soil should not be thrown on the centre of the plant, the object of hilling being to provide fine soil for the pegs to enter and mature evenly and for ease in harvesting. As a rule, in the creeping varieties the pegs easily reach the soil, but in certain cases a light roller run over the crop will facilitate this operation. In the bunch or erect growing varieties no rolling should be attempted, but a final higher hilling made if it is noticed the points have some distance to go to reach the soil.

Cultivation should be thorough, and an endeavour made to keep the soil in a loose and friable condition, especially around the plants.

Harvesting.

The time for harvesting is noted in the appearance of the foliage, which starts to yellow or lose colour, and by examination of the nuts. If the majority of the berries or peas are full grown and the inside of the shell has begun to colour and show darkened veins, the crop is mature and harvesting should not be delayed.

If the crop is harvested too early the proportion of "duds" is very great, while if deferred too long some of the nuts may germinate and others become detached from the plant when lifting, while the tops, having lost most of the leaves, will be of much less value for fodder. In some soils, notably the friable chocolate volcanic loams, the plants may be lifted by hand, when most of the nodule-bearing rootlets are left behind and only the root stock with the nuts is lifted. In other cases it is necessary to loosen the soil before lifting out. In small areas this is sometimes done with the digging fork inserted under the plant, which is lifted while the fork is worked underneath. In large areas a potato digger with an endless belt elevator from the shovel point is found very effective where the soil is dry enough to fall through the slats of the elevator and the crop is free from weeds.

An ordinary single-furrow mould-board plough with a 10 or 12 inch share is effective when the mould-board is removed, an improvement being found in the substitution therefor of some finger-bars which allow most of the soil to pass through and leave the vines and nuts uncovered.

A very satisfactory digger could, however, be made on the farm or by a local blacksmith by attaching to an ordinary wooden plough beam a knife edge to go under the plant and cut the roots just below the nuts; finger-bars at the rear of this knife edge would lift the plants and loosen the earth, thus facilitating the lifting by hand. The width of the knife edge should be sufficient between the attaching portions to the beam to allow of the whole plant passing through, and the depth should be regulated by the wheel or wheels in front. Perhaps a better idea might be given by taking the back off an ordinary earth scoop, together with

all the bottom excepting 6 inches in front, and substituting finger-bars slightly elevated to carry the plants and attaching the whole to a plough beam with handles. In a digger of this description, where one horse is used, the digging attachment would be to one side of the beam, while with two horses it would be in the centre, the operator straddling the row and the depth-regulating wheels being preferably two, one on each side of the line of plants.

It should always be remembered that the cutting of the roots as close to the pods as possible results in the greater quantiy of nitrogen being returned to the soil.

Harvesting should not begin until the dew is off and the tops are dry, and the operation should be regarded as a hay-making of the tops, and not more than can be handled should be lifted in any one day.

PLATE 37.
Poles around which stacks of peanut vines are to be built.

Curing.

After the plants are lifted and the soil shaken from the nuts they are allowed to lie either spread on the ground or in small bunches until the leaves are wilted, but not curled or brittle. They are then bound in small sheaves or taken separately and stacked until cured. The time in which the plants are allowed to wilt varies according to the weather, and in some cases stacking may be necessary within an hour of lifting.

The usual method of curing peanuts where the quantity is large is to place them in small stacks around a pole. From twenty to thirty poles will be required for an acre.

These poles should be reasonably stout, from 2 to 3 inches of hardwood in diameter at the bottom end, which should be sharpened. When erecting, holes are made in the soil with a crowbar, post-hole digger, or

earth auger, and the pole inserted or driven down with a mall to a depth that will ensure their not being blown over with the weight of the stack upon them. Crosspieces about 3 feet in length are now nailed across the post at right angles, one immediately above the other, 9 to 10 inches above the level of the ground; 3 by 1-inch hardwood battens answer the purpose admirably. According to the crop, six or seven rows are taken on each side of the poles, and the plants, when wilted, forked into one row on either side of the pole. When stacking, a few vines are placed across the crosspieces, which keep them off the ground, to form the foundation. The vines are then stacked by hand with the nuts next to the pole and tops outward, pressing down each layer and building evenly around the pole. From time to time a bunch should be divided and hung around the pole to bind the mass and to assist in keeping the centre high.

This latter is important in that it allows any rain falling to run off. When the stack is approaching 3 feet high the vines should be drawn closer round the top and finished off with a cap of grass as a thatch to run rain off. It is important that free circulation of air should obtain through the stack in order to facilitate curing. The building of thick or high stacks or pressing them too tight will tend to cause heating, with consequent damage to both fodder and nuts.

After about two weeks in the stack the peanuts may be stored in the barn, but the nuts should not be picked from the vines until preferably six weeks from the date of harvesting, as if picked too soon they are liable to shrivel, and there is danger of fermenting or moulding after picking.

PLATE 38.
Showing method used in building stacks round the poles. Completed stacks in background.

Picking.

The usual practice formerly was to pick the nuts from the cured plants by hand—a tedious process, the cost of which, if the ruling rate of wages were paid, would be prohibitive, since 60 lb. is considered a fair day's work. This practice of hand picking has been followed for ages, and is still the usual method adopted in countries such as India, China, Japan, &c., where labour is plentiful and cheap. In certain cases, too, the nuts are washed by agitation in frequently changed water and dried in the sun to obtain a clean inviting article for edible purposes. This is necessarily a costly undertaking, and would need a much higher price for washed nuts to compensate.

Other methods adopted in Queensland with a lessening of expense have been, in the case of the bunch nuts, to hold the stems in the hand and thresh the nuts off by beating across tightly-drawn wires or the edge of a board placed midway across a box or other receptacle to hold the nuts, and with both bunch and creeper to rub the whole plant over a wire-netting drawn tight until the nuts fall through. Subsequent winnowings remove trash and light pods, and it is stated thoroughly drying the resultant nuts in the sun will cause the stems or tails to break off in the bags, resulting in a clean sample when it reaches the market.

PLATE 39.—PEANUT PICKER AT WORK.

In recent years, however, labour and time saving machinery has been evolved which does very satisfactory work in picking, stemming, cleaning, grading, and bagging for market, without breaking or damaging any appreciable quantity of the pods.

Two types of pickers are on the market—one working on the principle of a cylinder grain-thresher and another in which the plants are drawn between spring points over a wire mesh in such a manner that the nuts are pulled off and fall through on to a conveyor, which carries them

through a winnowing process to a stemming apparatus, after which they go through a further winnowing and a cleaning and grading process.

The cost of machines of this description is too great for the individual in most cases, and it would be advantageous, where any considerable collective area was under crop, for farmers to co-operate in a purchase, when the machine, which is on wheels, could be transported from farm to farm.

Contract picking of peanuts should prove economical and effective as the picking crew, working day after day, naturally become expert; so that a greater average quantity is handled daily with less damage than when novices or hands out of practice are engaged.

When a power-driven picker is in use, it is advantageous to place it in a central position in the field where the poles with the stacked peanuts can be transported bodily to the machine, resulting in less handling. With suitable uprights with a cross bar attached to the dray a lever with a grip attached to the top of the pole and passed over the cross bar would use it as a fulcrum, when the long end of the lever being lowered to the shaft would lift the pole entirely clear of the ground, allowing of its quick and easy transport to the picker.

The stems or vines of the plant, after the nuts are detached by the picker, can be stacked, baled, or chaffed and used for forage purposes, while the "dud" nuts (small or immature) can be fed to stock.

Marketing.

Where more than one variety is grown it is important when marketing that each should be kept distinct. Peanuts are usually bagged whole for sale; in this condition care should be exercised to see that the shells are quite dry, as clean as possible, and free from immature nuts and foreign matter.

In localities where freights are high, it is sometimes more remunerative to grow suitable varieties for shelling and to market in that condition.

Special machinery is available to shell peanuts with a minimum of damage to the berries. Bruising of the product at shelling or during transport is injurious as decomposition is liable to set in and rancidity occur. Shelled kernels should also be absolutely dry before packing for the same reason.

Peanut Pool.

Legislation provides for the marketing, within Queensland, of all peanuts through the Peanut Pool Board, the headquarters of which is at Kingaroy.

Full information in connection therewith can be obtained by application to the manager or secretary at that centre.

The Board is generally a source of seed supply.

Pests.

Insect pests are of infrequent occurrence, so far the only attack noticed being occasional instances of mealy bugs on odd roots.

Vermin are very partial to the nuts, as are many birds outside those domesticated.

Disease.

The peanut is seldom subject to disease when grown under suitable conditions of climate, soil, and drainage. That most commonly noted is a form of leafspot (*Cercospora* sp.) which appears as brownish spots on the leaves, and is most frequent in crops maturing towards winter, and especially on sour or poorly drained land.

Others that are occasionally seen are possibly *Sclerotium rolfsii,* and a species of *Rhizoctonia,* which attacks the plant at the collar or that part of the stem at the point of its emergence from the soil. This is denoted by a cobwebby appearance due to the spread of mycelial threads, together with minute round white or brown bodies the size of mustard seeds which are the spore cases of the fungus. The effect on the plant is to stunt the growth where it is not killed outright. The affection, however, is seldom sufficiently serious to materially affect yields.

Yield.

The yield of the peanut crop will, of course, depend on the fertility of the soil, amount of rainfall, and cultural attention bestowed.

While it will bear a satisfactory crop under a small rainfall, showing to an extent that it is drought-resisting, it is not injured by excessive rains provided the soil is well drained. An instance of this was observed at Banyan in 1921, where a perfect sample of the Red Cross variety was seen which had experienced a fall of 120 inches of rain in the growing period.

Crops on a small scale have been estimated to produce 3 tons to the acre, and in the North field crops averaging 1 ton and over are not uncommon; but as a general rule, in satisfactory soils and under ordinary conditions with proper cultivation, 15 cwt. per acre might be expected as a fair average yield.

On many of the poor sandy soils which are recommended for bright tobacco, however, much lower yields, even with fertilizers, can be expected until the humus content is greatly increased by the ploughing under of suitable growing crops or otherwise.

Varieties.

As with most cultivated crops the number of varieties is not inconsiderable; their nomenclature, however, is somewhat varied according to the country in which they are grown. A variety in one country is often identical with that listed under a different name in another.

Varieties fall naturally into two groups—viz., the bunch or upright growers which produce the nuts around the base of the plant, and the creeping or procumbent kinds which produce the nuts along the stems for a considerable distance from the base. These again are divided into kinds which produce large and small nuts respectively.

The creeper varieties usually return a greater yield per acre, but the increased expense in harvesting is calculated to more than offset the somewhat lower average yield of those of upright growth.

The following varieties are most commonly grown:—

Red Spanish also Red Cross.—A strong upright grower with abundant foliage; small, well filled pods clustered about the base of the

plant; yields well and probably gives a lower proportion of shell to peas than other kinds. Peas are bright red in colour and of medium size with a high oil content. Favoured for shelling.

White Spanish.—A small podded variety with upright stems and heavy foliage; pods are thin, usually well filled and are clustered about the base of the plant. Peas are pale brown in colour and rich in oil. Perhaps the most early-maturing variety grown. Suitable for shelling.

Improved Spanish.—This variety has probably been developed by careful selection from the White Spanish which it resembles, except that the stems are stronger and not so upright. The chief difference, however, lies in the pods, which are much larger. Suitable for shelling.

Virginia Bunch.—A large-podded variety; stems upright, not as high as White Spanish and with less foliage. Pods are clustered about the base of the plant and contain usually two and sometimes three light-brown peas of good size. Pods are usually bright and clean, and the variety yields well. Recommended for sale as whole nuts.

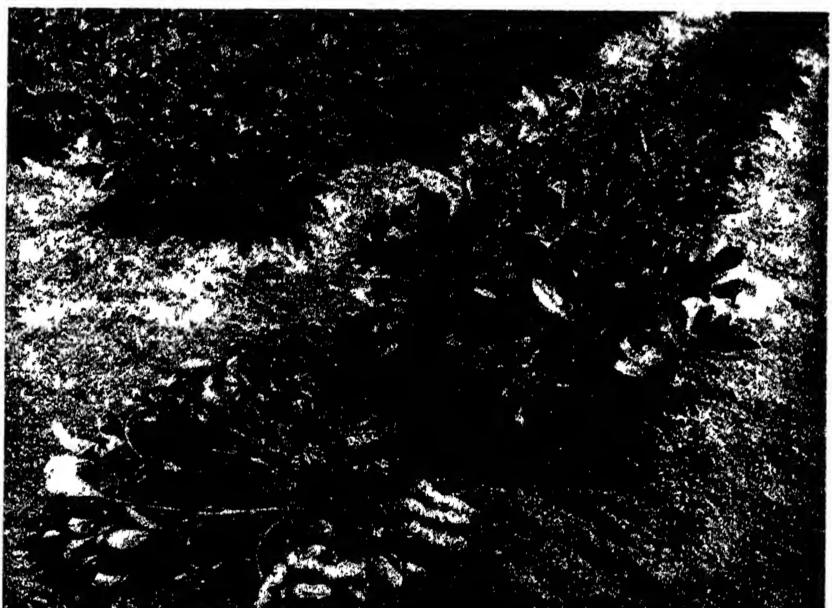

PLATE 40.—VIRGINIA BUNCH.

Valencia Bunch.—A small-podded variety with heavy foliage and upright stems. Pods are usually long, containing three or four small peas, sometimes more; peas are dull red in colour. The variety yields well, but the pods do not adhere so well in digging as with the previous-named varieties. Only suitable for shelling, as the pods are apt to burst during the roasting process.

The foregoing are all of bunch and upright growth, the Virginia Bunch being grown most largely for the whole-nut trade and the Red Spanish for sale as shelled for manufacture.

Chinese.—A large-podded variety of strong growth with creeping or prostrate stems and heavy foliage; pods scattered along the procumbent stems do not adhere too well in digging. The pods are much the same size as those of the Virginia Bunch as are the peas within. The variety is probably the same as that called Virginia Runner. The Chinese Runner formerly was largely imported from China, and was chiefly grown in the Cooktown district.

Large Japanese.—A creeping or procumbent variety of perhaps less vigorous growth than the Chinese, but carrying a slightly larger pod. It was considered superior to Chinese in the Cooktown district. Both this and the Chinese are suited for sale as whole nuts.

Mammoth, Jumbo, or Giant.—A creeping variety that yields probably the largest pod of all varieties. The shell, however, is very thick and the proportion of peas to pod lower than in other varieties. The pea is extra large, and on this account is sometimes favoured for particular confections. It is not considered suitable for cropping in this State in competition with more popular varieties.

Rotation.

In order to secure the most profitable return peanuts should be grown in a sequence or rotation with other crops preferably once in every three or four years.

Though the crop, in common with most other legumes, has the power of collecting the free nitrogen from the air and storing it up in small nodules on the roots, its value in this direction is not so great as cowpeas, velvet beans, and other legumes of similar growth, since in harvesting much of the root system of the peanut with adherent nodules is removed from the soil. The amount of nitrogen, however, added to the soil by the peanut crop is considerable and well illustrated in the improved growth of following crops, such as maize or potatoes.

In all crop sequences it is advisable at least once in three or four years to plough under a growing crop to maintain or build up the humus and decaying organic matter in the soil.

Choice of such a crop would be influenced by the volume of growth likely to be made in a short period and the rapidity of its decay or conversion to humus when ploughed under.

Crops such as cowpeas and velvet beans are popular through the amount of nitrogen they add to the soil; but sorghums, teosinte, millets, and especially Sudan grass are generally allowed to provide a greater amount of organic matter during a similar period of growth.

On loamy soils where potatoes, sweet potatoes, and maize would be grown preference would be given to the legume; but on sandy soils, particularly those suited to bright tobacco production in which the humus supply is usually low, preference should be given to the heavier-yielding non-legume.

A suitable sequence of crops is suggested:—

(*a*) For loaming soils—

First year—Legume, to be ploughed under.

Second year—Potatoes, sweet potatoes, maize.

Third year—Peanuts, cotton, broom millet.

(*b*) For sandy soils—

First year—Non-legume, to be ploughed under.

Second year—Hay or grain crop.

Third year—Peanuts, cotton, broom millet, tobacco.

Uses.

The peanut is a most valuable economic crop and capable of many diversified uses, the chief of which may be summarised:—

The whole plant as a stock food either to be fed off or harvested and stored for use as required;

The plant, exclusive of the nuts, cured as hay, in which it is close to lucerne in food value and fed to stock;

The nuts for edible purposes either as whole nuts or shelled for use in confectionery;

The nuts for oil;

The residue after extracting the oil, in some cases for edible purposes, but mainly for stock food or as manure.

As a rotative crop, also in sequence with tobacco, maize, and other crops, the peanut is commended.

Hay.

Whether the whole crop, especially the bunch or upright growing varieties, is harvested and stored as hay with or without the adhering pods the product forms a valuable stock food. The greatest economy, of course, lies in marketing the nuts and using the balance as hay, but where through a high cost of freight this is not practicable the added food value of the nuts is considerable.

As noted previously in this article, the harvesting of the crop should be regarded as a haymaking of the tops. As with lucerne the loss of the leaves in harvest results in a considerable reduction in fodder value as well as in weight. Care consequently should be exercised to prevent undue loss in this direction.

There is probably no better or more economical system of harvesting than the pole stacking previously described, the advantages of which should be obvious. The stack round the poll allows a free circulation of air below and through the curing mass; the curing is gradual with a full retention of the leaves, which retain their green colour, except round the edges of the stack where exposed to dew and direct sunshine.

There is less handling, as, when cured, the poles, each with its burden, can be lifted and transported to the picker, after which the hay can be stacked or baled ready for home feeding or sale.

The following analyses* comparing the fodder values of peanuts and lucerne are informative:—

—	Total Dry Matter.	Digestible Nutrients in 100 Lb.				Nutritive Ratio.
		Crude Protein.	Carbo-hydrates.	Fat.	Total.	
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	
Lucerne	91·4	10·5	39·0	0·9	51·6	1 : 3·9
Peanut vine	78·5	6·6	37·0	3·0	50·4	1 : 6·6
Peanut vine with nuts ..	92·2	9·6	39·6	8·3	67·9	1 : 6·1

In palatability, probably peanut hay is ahead of lucerne, as stock greedily eat the hard sun-dried stems, no matter how long exposed.

In feeding the hay or the whole cured plant to horses and cattle, the receptacle should allow of any soil adhering to the roots falling through; the danger in feeding mouldy peanut hay is the same as with mouldy hay of any other kind.

Feeding-off.

On farms where pigs are raised it is usual to turn the animals into the field to harvest such nuts as may be left on removal of the crop. This is especially desirable when creeping or running varieties are grown.

Occasionally also, where the bunch varieties are grown, the tops are mown, cured into hay, and removed prior to turning the pigs in to harvest the remainder. This would appear preferable to feeding off the whole crop as, though the animals would consume a certain amount of the vines, a greater quantity would be soiled and destroyed.

There is a prejudice against pigs fattened on peanuts, since the pork is soft and shrinks more in curing processes than when maize or other concentrates are fed; the lard, too, from peanut-fattened pigs is undesirably soft and oily.

These defects, it may be noted, appear in pigs fattened exclusively on peanuts, but it may be expected that when young animals are grown thereon and topped off with other foods known to produce firm flesh the difficulty would be obviated.

Manufactures.

In addition to the treatment of the shelled and unshelled peas for human consumption, there are numerous products as oils, butters, flours, meals, breakfast foods, relishes, sauces, confectionery, &c., manufactured wholly or partly therefrom.

Oil.

The chief value of the peanut is as a source of oil known to the trade as China oil.

The shelled peas of the large nuts, such as Virginia Bunch and Chinese Runner, contain an average of about 43 per cent., while the smaller nuts of the Spanish Bunch varieties, particularly the Red Spanish, frequently yield 52 per cent. of oil.

* Henry and Morrison in "Feeds and Feeding."

Amongst the uses of the oil are:—Finest oil as salad oil and for use in medicine, the arts, and as a lubricant for high-speed journals in delicate machinery, &c.; first quality grade for cooking and in the manufacture of margarine; also as a lubricant and harness dressing, &c.; lowest quality grades for soap-making and other industrial purposes.

The extraction of the oil is a simple process and entails less procedure and machinery than other oil-yielders. The bulk of the oil is obtained by simple pressure, and the balance recoverable on heating and again subjecting to pressure.

Oilcake or Meal.

Where particular attention is paid to the skinning and degerming of the peas before the oil is expressed, the resultant cake or meal is used in the preparation of human foods; otherwise, the cake is used for stock food and as manure.

Average analyses of peanut oil cake show, according to Henry and Morrison:—

—	Total Dry Matter in 100 Lb	Digestible Nutrients in 100 Lb				Nutritive Ratio
		Crude Protein	Carbo-hydrates	Fat	Total	
	Per cent.	Per cent.	Per cent.	Per cent	Per cent.	
From whole nuts	94·4	20 2	16 0	10 0	58 7	1 : 1·9
From shelled nuts	89 3	42 8	20 4	7 2	79 4	1 : 0·9

The feed value of these products is at once apparent; and, viewing the richness in protein as evidenced in the nutritive ratio, it becomes most valuable as a concentrate for addition to stock foods in making a balanced ration.

FIELD CROPS.

Speaking recently on crop prospects the Director of Agriculture (Mr. A. E. Gibson) remarked that the lucerne crop had in many instances been spoilt in harvesting by reason of excessive rains, and, no doubt, considerable quantities of hay had been more or less damaged. It was reasonable to believe, however, that from now onwards conditions would be more suitable for both the production and conservation of lucerne in the form of hay, provided the country experienced normal conditions usually associated with this period of the year.

Mr Gibson advised those farmers who contemplated increasing their lucerne areas to set about the initial preparation as soon as opportunity offered, with the fixed purpose, as far as possible, of eradicating every description of weed. It was imperative that the soil prepared for lucerne should be reduced to as fine a tilth as possible in order to stimulate rapid growth, and at the same time bring about rapid germination. Sowing by means of the drill in this crop was to be recommended, and better results would be achieved if the first half of the seed were sown at right angles to the second half. In this way a better planting was brought about, and the quantity of lucerne seed used could be reduced by at least 25 per cent., compared with the more common method of sowing.

Those who intended planting winter cereals were advised that fallowing operations should now be well under way, particularly in the case of the wheat areas. Any action that could be taken, which was calculated to bring about rapid germination of volunteer crops, such as oats and barley, should be given attention to, as considerable trouble already had been experienced in the wheat-growing areas from this source. The loss in quality of the grain, caused by foreign growth, was considerable.

The Housing of Poultry.

By P. RUMBALL, Poultry Expert.

A SURVEY of many farms indicates that one of the principal causes of impaired health and high mortality is due to inadequate housing. It is not the case only that the housing accommodation is too small, but that it is of the wrong design, and does not lend itself to the easy maintenance of those sanitary conditions necessary to health and vigour. Elaborate and costly houses are not necessary, but they should be of sufficient size for easy access, and the floors should be as impervious as possible, such as concrete, so as to permit of thorough cleaning at definite periods. Buildings are generally erected for a definite number of birds, but it is found that, as the flock increases, the tendency is to use these buildings for greater numbers than for which they were originally designed. This evil is not only noticed with reference to the accommodation of adult stock—where the least harm is caused—but it is more pronounced in the accommodation used for the rearing of young chickens and growing stock.

The success of a poultry raiser is dependent firstly upon the number of chickens that are reared to maturity, and, as overcrowding is one of the principal causes of mortality amongst chickens, the consequence of insufficient accommodation becomes more serious as a poultryman extends his business. It has also to be borne in mind that the loss through overcrowding does not end in the death of chickens. Others may survive improper treatment, but their health and vigour are so impaired that their potential egg yield is greatly decreased.

Systems of Housing.

There are three practices commonly adopted, viz.:—

(1) Intensive, where the birds are kept entirely under cover;

(2) Free range, where a house is erected to provide sleeping accommodation, and unrestricted liberty permitted; and

(3) House and yard, where a house is provided for sleeping quarters, and liberty is restricted by the erection of a run.

Under the intensive system, the birds are kept entirely under cover, and are thereby afforded the maximum protection from climatic conditions, ensuring greater stability in production. The health and condition of the birds are readily observed by the farmer. Further, it is possible to thoroughly free the house from excreta at regular intervals.

Under the free range conditions, some contamination from excreta of the stock naturally takes place, but, owing to the unrestricted range and the feeding on the soil by plant life, soil contamination does not become serious. The birds are, however, exposed to climatic variations, and the egg yield is not as stable as under the intensive system. There is, however, the compensation in the reduced cost of feeding, as birds obtain a good deal of their natural food supply by foraging.

The yard and house system has the disadvantages and none of the advantages of both the intensive and free range systems. The addition of the yard adds to the cost of accommodation. The birds are exposed to climatic conditions as much as they are under the free range system.

Egg production is not stable, nor are the birds in a position to gather any of their own food requirements. The most serious disadvantage, however, of this system is soil contamination. A good many of the highly contagious diseases of poultry, and internal parasites, are transmitted from bird to bird through the exereta. Many organisms of the common diseases of the fowl will lie dormant in the soil ready to cause infection on the first favourable opportunity. Although the exereta may be scraped regularly from the surface of the poultry yard, many of the minute organisms and worm eggs are below the surface, and it is only necessary for favourable conditions to arise before infection takes place.

When the house and yard system is adopted, two yards should be erected for each house. This enables one yard to be spelled, planted with some crop suitable for green feed, and the soil thus sweetened.

For the specialist poultry keeper, where large numbers of laying stock are to be kept, the intensive system of housing is most suitable. For the farmer who raises poultry as an adjunct to other rural pursuits, the free range system offers many advantages.

Care of Growing Stock.

In the housing of growing stock the pens are only occupied throughout six months of the year, and as egg production does not enter into consideration, the exposure to climatic conditions is not so material. Likewise, soil contamination is not pronounced. To obtain the maximum development, exercise must be provided. The free range system answers admirably for the purpose of the development of growing stock, but as several hundred pullets of different ages have to be reared, it is necessary to erect netting fences for the separation of the various lots. These runs should be made as large as the land will permit, allowing not less than 6 square yards per bird, and the number in any one pen should not exceed one hundred.

Brooding of Chickens.

There are numerous systems of brooding chickens. The system to be adopted depends largely upon the number to be handled, the personal inclinations of the farmer, and the capital to be expended. The subject of brooding is too extensive for full reference in this article.

Intensive Housing System.

Under this system of housing, as previously mentioned, the birds are kept entirely under cover in fairly large sheds, and in relatively large numbers. This being so, strict attention has to be paid to the physical condition of the bird, and to the question of feeding. As the bird only has a very restricted space, 4 square feet per bird being about the correct area, exercise has to be promoted to ensure the birds being kept in good condition. This is done by having scratching material or litter, such as grass, straw, leaves, or chips strewn over the floor, to the depth of 4 to 6 inches, and all the grain portion of the ration being fed in it. This naturally promotes a good deal of scratching on the part of the bird in search of grains that have become covered, and it should be patent to all poultry raisers that the feeding of the evening grain should not be left until the day is drawing to a close. Many farmers are in the habit of allowing a good deal of range to their birds, with the consequence that they gather a fair amount of natural food, and naturally

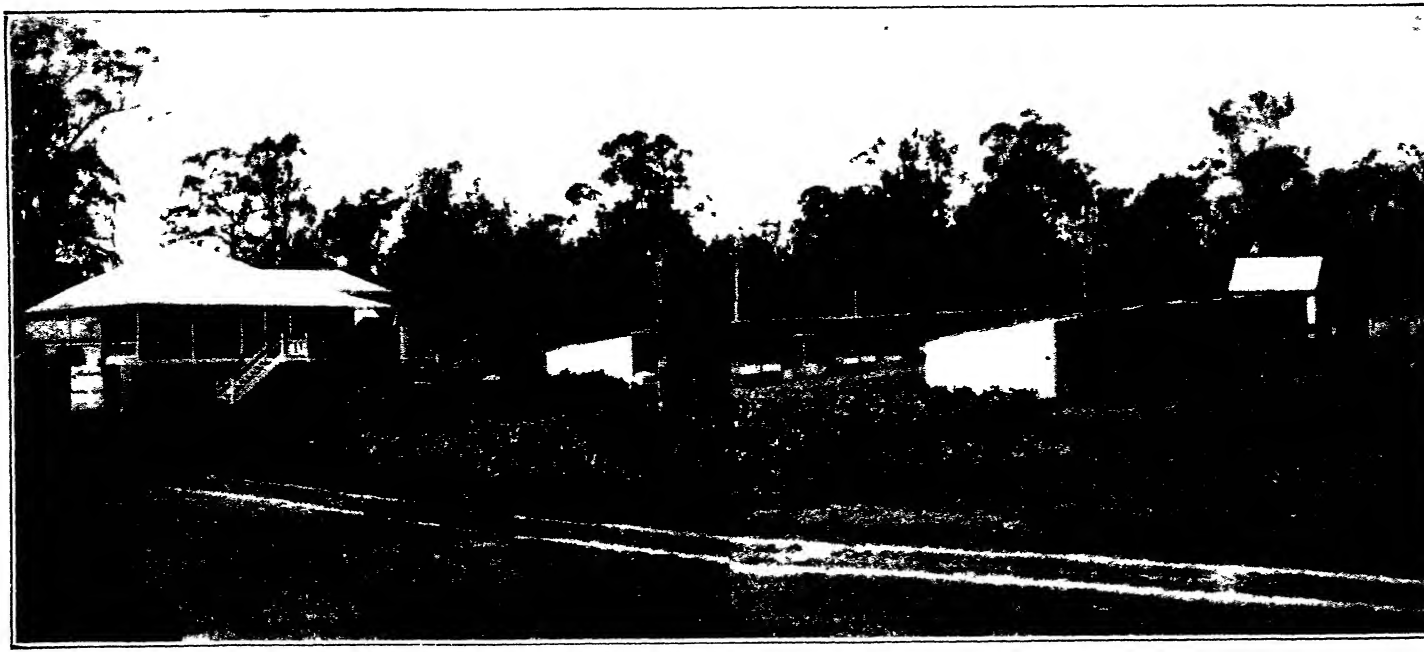

PLATE 41.—ON A QUEENSLAND POULTRY FARM. THE INTENSIVE SYSTEM ADOPTED WHOLLY FOR LAYING STOCK.
Housing under the intensive system allows 3½ to 4 square feet of floor space for each bird, under the free range system 2 square feet are sufficient.

do not consume as much as birds kept entirely under cover. If at any time poultry breeders keeping birds under such conditions think it desirable, on account of the damage done by their poultry to crops, haystacks, &c., to change over to the intensive system, the question of feeding assumes a most important point; in fact, any person keeping poultry under these conditions must give the question of feeding the utmost consideration, as it is impossible for the birds to procure anything but what they are supplied with. The overlooking of this point by many poultry farmers has caused this system of housing to be condemned.

This system of housing poultry enables a greater number of birds to be kept on a given area than any other. It permits of birds being handled in large units, and therefore not only reduces the natural labour but goes a long way in reducing the cost of production, which is a big feature, especially in times of high-priced foods. It is also much easier to detect sick and unproductive birds in an area of, say, 400 square feet than is the case when large runs are used, and therefore the early disposal of these, a practice highly desirable, is facilitated. With this system also there is generally greater attention given to the questions of the construction of the houses and the numbers housed in a shed of certain dimensions. Both these questions play a very important part in the question of disease, and the development of stock. It is not uncommon to notice a house built to house at night fifty laying hens having sixty-five birds in it. To do this, possibly the perches have been placed closer together, and when it is suggested to the breeder that he is overcrowding, he states that they only sleep in the shed and he lets them out on free range during the day. Although it must be admitted that stock on free range will possibly put up with much severer conditions than those kept in pens, it is maintained that it does not matter how good the conditions are during the day, they will not overcome the ill-effects of overcrowding during the night. With the intensive system of housing, over crowding is not noticed to the same extent; the breeder knows how many birds the shed was built for, and there is no point that can be raised in favour of going beyond this number.

Types of Intensive Laying Sheds.

There are several types of laying sheds, the shape of the roof being the principal point, but as the majority of poultry raisers have to do the erection of their own sheds, the lean-to type will prove most acceptable. The illustration shows the cross section of a shed, 20 feet deep, and of indefinite length. This shed can be built in sections of 20 feet, and provision made for additions as required, each section holding 100 laying hens.

The cross section shows a veranda, which commences just under the rafters in front. This veranda serves to prevent a good deal of rain beating into the house from the front, and by not going right to the top of the roof allows a free circulation of air. If it is desired the roof could be extended by 3 feet and the veranda not used, but in that case the height of the shed in front could be a little bit less. Ventilation is also provided for at the back, the iron going from the floor level to the bottom of the 6-inch rafter. This allows a 6-inch space right along the back of the shed between the battens which carry the iron at the back and the roof. This space is protected to some extent from the driving influence

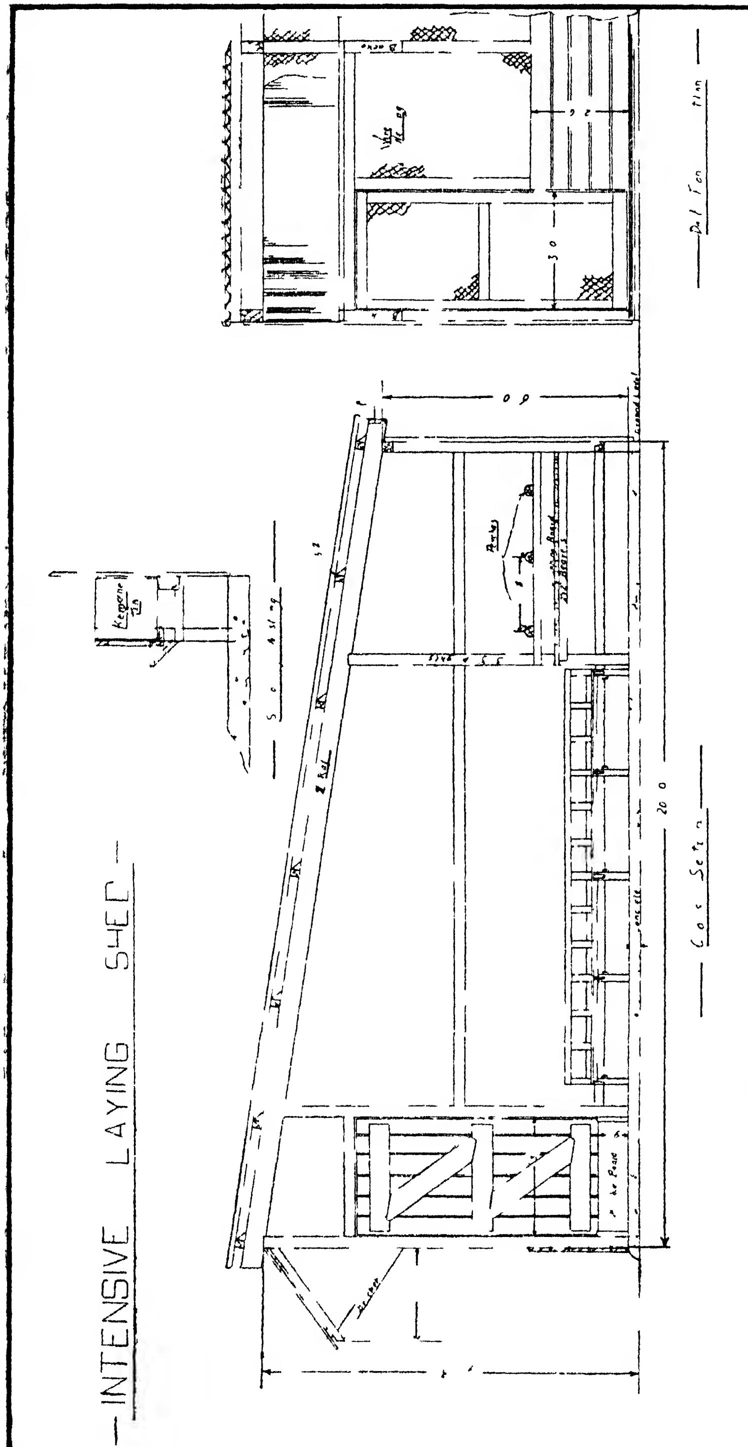

PLATE 42.—SHOWING END SECTION AND PART FRONT ELEVATION OF INTENSIVE LAYING SHED.

End section, with the exception of door and battens to carry the iron, should be erected every 10 feet in a shed of these dimensions.

of the wind by guttering being placed on the rafters, which extend beyond the back wall. but further protection for the birds from cats, &c., should be made by netting this space.

Materials.—The shed should be built with good, sound hardwood posts, although where desired solid, sapped bush timber could be used for uprights, but the average builder would find sawn timber easier to handle. All other frame work should be sawn timber, that coming in contact with the ground hardwoods, and the balance pine. The dimensions of the timber are shown in the cross section, and as the building is of goodly dimensions, it would not be advisable, on the plea of economy, to use lighter material. The walls and roof should be of iron, and also the wind break in front, although timber, if cheaper, could be used.

The Site.

Site of House.—In commencing to erect a building upon the intensive system, it being a large building and of a permanent nature, the site chosen must receive due consideration, and, as many poultry raisers start in a small way, provision should be made for extensions.

In addition to the foregoing, although it is recommended to concrete the floor, the position chosen should be well drained, and, if the building is to be erected on relatively flat country, the floor should be raised several inches above the surrounding country, and well rammed to provide a solid foundation.

Aspect.—The house should face north or north-east. A northerly aspect permits of the maximum penetration of the sun's rays into the house during the winter, when it is desirable, and the minimum during summer; also a good deal of our continuous rains come from a south-easterly direction.

The Layout.

General Fittings.—In the cross section a door constructed of timber is shown, while the front elevation shows another of netting. Although this shed is built for the purpose of keeping the birds entirely under cover, it frequently is desirable to let the birds out into small runs during cleaning operations, or it may be that, in a long section, it is desirable to go into a pen direct. This is only possible when front doors are provided. The door in the end section permits a person feeding, &c., going from pen to pen direct, and, for the small cost in labour and material, both doors should be provided when the building is first constructed.

The perches, three in number, are placed along the back of the shed extending the full length. Under the perches is a dropping board. The advisability of this or otherwise is left to the individual breeder. If it is not to be cleaned daily, it should not be provided, but for the breeder who uses it there is a ready market for pure poultry manure, while, at the same time, he keeps his litter clean for a longer period. Another system by which the droppings may be kept from mixing with the scratching material is by placing timber, say, 6 inches in front of the front perch the full length of the building. This timber would need to be at least 18 inches high, and it may be as well to cover the whole area with netting to prevent the birds from getting in among the droppings. This pit, however, would need to be cleared out fairly frequently to prevent offensive odours, as there would be nothing to absorb any moisture. With the

dropping board the birds have the full floor to scratch over, but a sharp lookout must be kept for red mite, as it provides additional harbour for them.

The nests are shown supported on a framework on the side of the building. These are kerosene tins on their sides. Two-thirds of each side is cut out. This provides a top which assists in keeping clean nests, and by both sides being cut the excessive heat is reduced. These should be placed at the coolest end of the building. Even although nests are provided many birds will persist in laying under them or in some old corner. If this is the case, the nests could be placed on the ground, as it is as well to induce the birds to make use of them to keep the eggs as clean as possible. Drinking and feeding receptacles are left to the breeder's own device. Some may be able to make use of some form of automatic water system, others may have to depend upon the kerosene tins. Some breeders may use dry mash hoppers, while others feed a wet mash. The principal feature is to provide ample water and sufficient feeding space for your stock. It is better to overdo both these features than to economise in this direction.

FAT-LAMB PRODUCTION—LESSONS FROM NEW ZEALAND.

Pasture improvement as a means to adequate feeding was an essential factor in profitable fat-lamb production, pointed out the Agrostologist of the New South Wales Department of Agriculture in a recent wireless address. In New Zealand, said the speaker, he had been impressed by the provision made for the supply of succulent pasturage on the numerous farms where the production of prime sucker lambs was aimed at.

In that country good sheep management, feeding, and breeding had gone hand in hand. The New Zealand lamb raiser had realised many years ago that in order to produce a quicker-maturing, prime quality lamb, grading up of the pastures was absolutely essential, as early-maturing stock, whether beef or mutton producers, required an abundance of palatable, nutritious feed.

The main reasons why New Zealand could produce and maintain a supply of sucker lambs suitable for the export trade were:—

(1) The excellent pastures available, also climatic conditions which were conducive to the optimum growth of nutritious English grasses and clovers.

(2) The utilisation only of sheep of the highest quality in the production of export lambs.

As New Zealand practically depended on grass-land farming to provide all the feed required for sheep and cattle, it was only to be expected that every farmer had the grass-land "sense" particularly well developed. In New Zealand 16,000,000 acres of land had been planted with seed of succulent pasture plants such as perennial rye, cocksfoot, perennial red and white clovers, and 300,000 tons of artificial fertilizers were applied to grass-land areas annually. The New Zealand farmer appreciated the value of his pastures, and all his efforts were centred on maintaining a high state of soil fertility.

When the soil fertility of any area decreased, it was inevitable that the plants associated with a high standard of fertility would diminish in quantity and ultimately disappear from the pasture, poorer quality pasturage and weeds taking their place. Good quality stock and particularly fat lambs and baby beef could not be raised on poor quality grass-land areas.

Agricultural Notes.

By H. S. HUNTER, Agricultural Branch.

SEASONAL PROSPECTS.

THE advent of hot weather after the wet conditions of December has stimulated the growth of vegetation and facilitated completion of the wheat harvest. It has been favourable also for haymaking, and full advantage has been taken of it in the principal lucerne-growing areas, where the crops had made excellent growth. The markets have been heavily supplied with lucerne chaff and lucerne hay, both of which lines have been selling freely at low values. Many of the offerings in the earlier part of the month were of indifferent quality, due to inclement weather at the time they were cured.

Potatoes also have been arriving in large quantities, with, as a result, unattractive prices to the grower, but in many instances the return was unnecessarily low owing to faulty grading and bagging. Uniform grading of most lines of farm produce, particularly potatoes, is essential if the consignment is to be disposed of to the best advantage.

Wheat.

From reports to hand at the time of writing, the deliveries to the Pool are estimated to represent about half of the current season's crop. Late deliveries will be unavoidable this year owing to the fact that weather conditions have interfered, not only with harvesting operations, but also with the transporting of the grain to the receiving depots.

The same set of conditions has delayed the initial working of the fallows of the proposed wheat areas for the 1934-35 season. Early and thorough preparation of the land is an important factor in successful wheatgrowing under Queensland conditions. It places the land in receptive condition for the trapping of moisture from the late summer rains, and facilitates the early germination of any grain and weed seeds which may be present in the soil. The present season has favoured volunteer growths, the early eradication of which is desirable.

Canary Seed.

The harvesting of this crop also has been delayed by weather conditions. Clean land is more essential, perhaps, for canary seed than for the other cereals.

One of the causes of excessive expenditure in connection with the Canary Seed Board's operations is the necessity for cleaning the seed to fit it as a merchantable product which would conform to pure seed regulations existing in this and other States of the Commonwealth. This has necessitated, in some instances, the cleaning of consignments three and four times. The cost of the first cleaning is a pool charge, but all subsequent cleanings are individual charges against the consignment concerned. It therefore is in the interests of canary seed growers to produce grain free from foreign seeds. The crop should be grown on land which is as far as possible free from volunteer growths of winter cereals and weeds.

Two weeds which give a considerable amount of trouble are fat hen (*Chenapodium*) and convolvulus (*Polygonum vulgare*). Incidentally, consignments have been received containing *Datura* or thorn apple, sometimes known as oil plant, and such are held up for cleaning before any

advance payment is made. The *Datura* plant is easily distinguishable and, therefore, roguing from the crop during harvesting operations is facilitated.

Cotton.

Some abandonment of crops has been caused by more or less excessive wet conditions, especially in the Central district. It is believed, however, that at least 70,000 acres are under cotton with prospects of producing profitable yields.

Reports from all centres indicate that although the season has been fairly wet to date, no excessively rank development of the plant has occurred, the majority of the crops having plants of a nice type, and carrying a good crop of flower buds and young bolls, with the most advanced crops bearing several well-developed bolls.

Good rains will be required in the near future in order to develop the crop which is now setting, and given these it is anticipated that many heavy yields will be obtained in all districts.

Insect attacks have been very light so far, the main trouble being mostly terminal loss caused in the earliest planted crops by the rough boll worm and to some extent by the tip-boring worm.

The season has demonstrated the value of cultivating as soon as the rows of young seedlings are discerned. Where this has been done even the growers with large acreages have well-cultivated fields, but where it has been neglected the continuous showery conditions produced such a rank growth of pig weed and summer grass that the later cultivations could be made only with great difficulty, and in extreme cases a portion of the individual acreage has had to be abandoned.

Dairying.

The output of dairy products is exceptionally heavy in all districts, and in some instances the factories are experiencing difficulty in coping with the quantities of cream coming forward. Australian butter reached its lowest level in London last month, when it was quoted at 63s. per cwt. Unfortunately, the local price has been influenced accordingly. The lot of the dairyman should be improved to some extent when the stabilising legislation, recently passed by the Commonwealth and the States, becomes operative.

Another step in this direction was taken in Sydney last month, when an interstate conference of dairy industry representatives agreed on proposals for the regulations which are to be set up under the Commonwealth Act.

Fruit.

The deciduous fruit season has been marked by low values owing to the size of the crop and the high proportion of fruit affected by excessively wet weather. An excellent yield of apples is in prospect, but marketing difficulties are anticipated unless the local market can be relieved by increased export. Last season witnessed an increase in production of approximately 100,000 cases, and a further progressive increase is expected this year.

Banana and pineapple plantations benefited by the wet conditions, but weeds have caused considerable trouble, necessitating the use of sprays. Permits have been issued covering the planting of over 4,000,000 banana suckers, the heaviest plantings having taken place in the Currumbin area. Growers in all areas, including the North Coast, have been warned of the necessity of vigilance for the early detection of bunchy top infestation.

Maize Varieties for the Lockyer Valley.

A report of the trials conducted at the Queensland Agricultural High School and College, Gatton, during the seasons 1925-26 to 1932-33 inclusive, by J. R. A. McMillan, M.Sc. (Cornell), Senior Plant Geneticist, Division of Plant Industry, C.S.I.R., and W. W. Bryan, B.Sc. Agr. (Queensland), Instructor in Plant Breeding, Q.A.H.S. and C.

IN view of the importance of maize-growing in the Lockyer Valley of Queensland, it was thought desirable to conduct experiments to determine the most suitable variety or varieties for the district. To this end work was commenced at the Queensland Agricultural High School and College in the year 1925-26, and is still in progress. It was felt, however, that as some definite results have been obtained, they should be made available to growers.

The maize is grown under conditions approaching, as far as possible, those which would be adopted by progressive farmers in the district, although certain modifications had of necessity to be adopted since the work is experimental. In the Lockyer Valley it is usual to grow maize on the same land for two or three years in succession, hence it was decided to conduct the trials on land in its second season under maize.

The site chosen is changed annually in accordance with the College farm rotation, but the soils throughout are fairly uniform, being heavy black soils with calcareous nodules forming a sub-surface layer—a Tshernosemic phase. Fertilizers are not used since previous experiments have not shown any beneficial response to them.

The average annual rainfall for the district is between 27 and 28 inches, but the majority of this falls during the maize-growing season. The actual amounts for the growing season are given with the results each year (see below).

Varieties Used and Sources of Seed.

It was decided to include in the trial some of the most promising varieties used in Queensland and New South Wales which would be likely to succeed under the conditions. Seed of these varieties was obtained originally from the State Departments of Agriculture. In order to ensure uniformity of strain within the variety, subsequent seed was and is being obtained annually from a State Department of Agriculture when possible. Otherwise it is produced at the College under isolated conditions in order to prevent cross breeding. The following varieties are obtained regularly, or were obtained until discarded, from the sources stated:—Golden Beauty, Funk's Yellow Dent, Improved Yellow Dent, and Red Hogan from the Department of Agriculture and Stock, Queensland; Fitzroy, Giant White, Golden Beauty, Golden Nugget, Golden Superb, Hickory King, Kennedy, Leaming, Manning Silvermine, and Yellow Hogan from the Department of Agriculture, New South Wales. Red Nib is obtained annually from the same seedsman. For comparison with the abovementioned varieties, seed is selected

from College-grown crops of Fitzroy, Improved Yellow Dent, and Red Hogan. Thus, in all, seventeen varieties have been tested, some of which have been discarded when proved unsuitable.

Methods.

The land is prepared in the usual manner sometime before it is required. At planting time drills 4 to 5 inches deep and 4 feet 6 inches apart are opened with a specially-made double mould-board attached to the tines of a cultivator. A wire, with tapes tied at intervals of 3 feet to act as markers, is stretched along the row, and five seeds are sown at each marker. The wire is removed and the drill closed by means of a single-row scuffler or harrows, the seeds being covered to a depth of about 2 inches. After germination the hills are thinned down to a uniform stand of three plants per hill. The plants removed from each hill are taken at random—they are not selected. The crop is cultivated in a normal manner such as would be done by the better farmers in the district, with the possible exception that a little more chipping is done because of serious infestations of nut grass (*Cyperus rotundus*) in some paddocks.

The arrangement of the plots in the seasons prior to 1928-29 was of the systematic checker-board type with check plots every third. Since then Fisher's methods of randomised arrangements have been used, either as a latin square or randomised blocks. The number of plots of each variety varies from six to ten. Unpublished data from College Uniformity Trials suggest the use of a plot eight to ten rows wide and one chain long as being the most efficient. The plots in the trial, therefore, are ten rows wide and one chain long, and are thus about one-fourteenth of an acre in area. Between the ends of plots a lane 6 feet wide is left, but no space is left at the side of plots. To eliminate border effect at the sides of the field, two guard rows are sown on each side.

Not all of each plot is harvested for experiment purposes. The outer row on either side of each plot and the two end hills at each end of each row are discarded in order to eliminate competition and border effect respectively. The remainder of the inner eight rows of each plot are harvested and bagged separately. The area of this portion of the plot is about one-twenty-second of an acre. Later the ears are shelled, the grain weighed, and a representative 2-lb. sample is taken from the produce of each plot by means of a stick sampler. This sample is analysed for moisture content in a standard Brown Duvel tester, duplicate tests being made. All weights are then standardised to a uniform basis of 14 per cent. moisture in order to determine the true value of a variety in comparison with others.

Results.

The results of the trials conducted to date are given separately for each season in the accompanying tables. Only mean yields of varieties are given, and all yields are on a basis of 14 per cent. moisture. Individual plot yields are available to workers wishing to use them.

Any variety which is significantly better than another is also better than those lower in the table than the first one exceeded. No differences, other than those shown as such, are significant.

Season 1925-26.

Plan.—Systematic ; two ranges each with every variety included once ; check plot every third.

Plot Size.—Ten rows, 77 yds. long. *Planting Date.*—8th January, 1926.

Rainfall over Growing Period.—5·6 in. (drought year).

Variety.	Bushels per Acre.	Significantly Exceeds.
1. Red Hogan (College) (Check)	21·95	4 *et seq.*
2. Fitzroy (New South Wales)	19·49	7 *et seq.*
3. Improved Yellow Dent (Queensland)	19·11	7 *et seq.*
4. Yellow Hogan (New South Wales) .. .	17·05	8 *et seq.*
5. Funk's Yellow Dent (Queensland)	16·42	8 *et seq.*
6. Red Hogan (Queensland)	15·09	9
7. Golden Beauty (Queensland)	14·71	9
8. Golden Beauty (New South Wales)	12 07	..
9. Golden Nugget (New South Wales)	10·38	..

Analysis by means of check plot method, a calculated yield being determined for every plot, thus—Calculated yield of $A = \frac{2C_1 + C_2}{3}$ where the plot order is $C_1\ A\ B\ C_2$, etc.

S E. single row = 5·44 per cent.

Season 1926-27.

Plan.—Systematic checkerboard ; ten plots of each variety ; check plot every third.

Plot Size.—Ten rows, 1 chain long. *Planting Date.*—30th December, 1926.

Rainfall over Growing Period.—16 74 in.

Variety	Bushels per Acre.	Significantly Exceeds.
1. Fitzroy (New South Wales)	42 88	6 *et seq.*
2. Improved Yellow Dent (Queensland)	41·33	6 *et seq.*
3. Golden Nugget (New South Wales) .. .	37·17	6 *et seq.*
4. Yellow Hogan (New South Wales) ..	34 93	6 *et seq.*
5. Golden Beauty (Queensland)	29·60	6 *et seq.*
6. Red Hogan (College) (Check)	28 41	7
7. Golden Beauty (New South Wales)	24·62	..

Analysed by Student's method against check.

Season 1927-28.

Plan.—Systematic checkerboard ; ten plots of each variety ; check plot every third.

Plot Size.—Ten rows, 1 chain long. *Planting Date.*—28th December, 1927.

Rainfall over Growing Period.—24·35 in.

Variety.	Bushels per Acre	Significantly Exceeds.
1. Fitzroy (New South Wales)	62·81	3 *et seq.*
2. Improved Yellow Dent (Queensland) ..	60·21	3 *et seq.*
3. Golden Nugget (New South Wales)	49·05	4 *et seq.*
4. Golden Beauty (Queensland)	46·17	7
5. Red Hogan (College) (Check)	45·27	7
6. Yellow Hogan (New South Wales)	44·49	7
7. Golden Beauty (New South Wales)	37·15	..

Analysed by Student's method against check.

Season 1928-29.

Plan.—Nine Randomised Blocks. *Plot Size.*—Nine rows, 1 chain long.

Planting Date.—26th December, 1928. *Rainfall over Growing Period.*—16·74 in.

Variety.	Bushels per Acre.	Significantly Exceeds.
1. Golden Nugget (New South Wales)	63·3	6 *et seq.*
2. Improved Yellow Dent (Queensland)	59·9	10 *et seq.*
3. Improved Yellow Dent (College)	59·4	11 *et seq.*
4. Leaming (New South Wales)	59·2	11 *et seq.*
5. Fitzroy (College)	58·7	11 *et seq.*
6. Fitzroy (New South Wales)	57·9	11 *et seq.*
7. Giant White (New South Wales)	56·4	11 *et seq.*
8. Yellow Hogan (New South Wales)	55·9	12
9. Golden Beauty (Queensland)	55·2	12
10. Hickory King (New South Wales)	54·7	12
11. Manning Silvermine (New South Wales) ..	51·0	12
12. Golden Beauty (New South Wales)	37·3	..

Three blocks were discarded at harvest owing to the passage of storm waters across them. This upset the standard method of analysis, and hence no S.E. for the field was calculated. Significant differences were obtained by direct comparison of one variety with another.

Season 1929-30.

Plan.—Seven Randomised Blocks. *Plot Size.*—Five rows, 1 chain long.

Planting Date.—6th January, 1930. *Rainfall over Growing Period.*—19·17 in.

Variety.	Bushels per Acre.	Significantly Exceeds.
1. Fitzroy (Short)	73·6	6 *et seq.*
2. Fitzroy (New South Wales)	73·57	6 *et seq.*
3. Improved Yellow Dent (Queensland)	67·59	7 *et seq.*
4. Leaming (New South Wales)	67·27	7 *et seq.*
5. Fitzroy (College)	66·98	10 *et seq.*
6. Improved Yellow Dent (College)	62·11	13 *et seq.*
7. Yellow Hogan (New South Wales)	59·92	13 *et seq.*
8. Hickory King (New South Wales)	59·83	13 *et seq.*
9. Golden Beauty (Queensland)	59·59	13 *et seq.*
10. Golden Nugget (New South Wales)	57·27	14
11. Manning Silvermine (New South Wales) ..	56·49	14
12. Giant White (New South Wales)	56·13	14
13. Hickory King (Short)	51·17	..
14. Golden Beauty (New South Wales)	48·26	..

S.E. of a mean treatment yield = 2·54 per cent. or 1·56 bushels per acre.

Differences exceeding 3 × S.E. or 4·67 bushels per acre are significant.

The varieties marked "(Short)" were obtained from Mr. Short, Queen street, Grafton.

Considerable difficulty was experienced in obtaining seed supplies, and on this account only small plots of five rows could be sown.

Season 1930-31.

Plan.—Eight Randomised Blocks. *Plot Size.*—Ten rows, 1 chain long.
Planting Date.—11th January, 1931. *Rainfall over Growing Period.*—15·48 in.

Variety.	Bushels per Acre.	Significantly Exceeds.
1. Leaming (New South Wales)	56·16	5 *et seq.*
2. Improved Yellow Dent (Queensland)	51·00	11 *et seq.*
3. Improved Yellow Dent (College)	50.40	11 *et seq.*
4. Fitzroy (New South Wales)	49·0	12
5. Yellow Hogan (New South Wales)	48·51	12
6. Fitzroy (College)	47·32	..
7. Golden Nugget (New South Wales)	46·28	..
8. Kennedy (New South Wales)	45·23	..
9. Golden Beauty (Queensland)	44·9	..
10. Hickory King (New South Wales)	44·17	..
11. Golden Superb (New South Wales)	43·11	..
12. Giant White (New South Wales)	41·69	..

S.E. of a mean treatment yield is 2·46 bushels per acre.
Differences exceeding 3 × S.E. or 7·39 bushels per acre are significant.

Season 1931-32.

Plan.—Nine Randomised Blocks. *Plot Size.*—Ten rows, 1 chain long.
Planting Date.—8th January, 1932. *Rainfall over Growing Period.*—7·33 in. (drought year).

Variety.	Bushels per Acre.	Significantly Exceeds.
1. Improved Yellow Dent (Queensland)	30·67	3 *et seq.*
2. Leaming (New South Wales)	25·9	5 *et seq.*
3. Fitzroy (College)	24·5	7 *et seq.*
4. Kennedy (New South Wales)	22·7	7 *et seq.*
5. Golden Nugget (New South Wales)	19·8	10 *et seq.*
6. Golden Superb (New South Wales)	19·5	11
7. Golden Beauty (Queensland)	16·4	..
8. Yellow Hogan (New South Wales)	15·8	..
9. Giant White (New South Wales)	15·6	..
10. Hickory King (New South Wales)	14·4	..
11. Fitzroy (New South Wales)	14·2	..

S.E. of a mean treatment yield = 1·73 bushels per acre.
Differences exceeding 3 S.E. or 5·2 bushels per acre are significant.

Season 1932-33.

Plan.—8 by 8 Latin Square. *Plot Size.*—Ten rows, 1 chain long.
Planting Date.—23rd November, 1932. *Rainfall over Growing Period.*—19·23 in.

Variety.	Bushels per Acre.	Significantly Exceeds.
1. Fitzroy (New South Wales)	54·55	4 *et seq.*
2. Improved Yellow Dent (Queensland)	53·73	4 *et seq.*
3. Fitzroy (College)	52·83	5 *et seq.*
4. Leaming (New South Wales)	49·65	5 *et seq.*
5. Golden Nugget (New South Wales)	45·55	6 *et seq.*
6. Red Nib	36·68	7 *et seq.*
7. Kennedy (New South Wales)	31·98	8
8. Golden Superb (New South Wales)	28·65	

S.E. of a mean treatment yield = 1·09 bushels per acre.
Differences exceeding 3 S.E. or 3·27 bushels per acre are significant

SUMMARY OF RESULTS.

(BUSHELS PER ACRE—14 PER CENT. MOISTURE.)

——	1925-26	1926-27.	1927-28	1928-29	1929-30	1930 31.	1931-32	1932 33.
Fitzroy (New South Wales)	19·49	42·88	62·81	57·9	73·57	49·00	14·20	54·55
Improved Yellow Dent (Queensland)	19·11	41·33	60·21	59·9	67·59	51·0	30·7	53·73
Golden Nugget	10·38	37·17	49·05	63·3	57·27	46·28	19·8	45·55
Yellow Hogan	17·05	34·93	44·49	55·9	59·92	48·51	15·8	..
Golden Beauty (Queensland)	14·71	29·6	46·17	55 2	59·59	44·9	16 4	..
Golden Beauty (New South Wales)	12·07	24·62	37·15	37·3	48·26	..	..	..
Red Hogan (College) ..	21·95	28·41	45·27	..	..	..	..	..
Funk's Yellow Dent ..	16·42	..	..	..	..	..	..	..
Fitzroy (College)	..	..	..	58·7	66·98	47·32	24 5	52·83
Leaming	..	..	..	59·2	67·27	56·16	25 9	49·65
Giant White	..	..	..	56·4	56·13	41·69	15 6	..
Hickory King	..	..	..	54·7	59·83	44·17	14 44	..
Improved Yellow Dent (College)	..	..	..	59·4	62·11	50·4	..	..
Manning Silvermine ..	..	..	..	51·0	56·49	..	..	..
Kennedy	..	..	..	..	..	45·23	22·7	31·98
Golden Superb	..	..	..	..	..	43·11	19·5	28 65
Red Nib	..	..	..	..	..	..	..	36·68

COMPOSITE RESULTS.

The method of analysis is as for Randomised Blocks, each season being treated as a block. (*Maskell.*)

In each analysis only the longest period available for the varieties included has been given.

Period 1925-26 to 1927-28 (3 Seasons.)

Variety.	Bushels per Acre	Significantly Exceeds.
1. Fitzroy (New South Wales)	41·7	3 *et seq.*
2. Improved Yellow Dent (Queensland)	40·15	5 *et seq.*
3. Golden Nugget (New South Wales)	32·2	..
4. Yellow Hogan (New South Wales)	32·2	..
5. Red Hogan (College)	31·9	..
6. Golden Beauty (Queensland)	30·17	..
7. Golden Beauty (New South Wales)	24·6	..

S.E. of a mean treatment yield is 2·69 bushels per acre.

Differences exceeding 3 S.E. or 8·06 bushels per acre are significant.

Mean = 33·3 bushels per acre. Significant difference = 24·2 per cent. of mean.

Period 1925-26 to 1929-30 (5 Seasons.)

Variety.	Bushels per Acre.	Significantly Exceeds.
1. Fitzroy (New South Wales)	51·34	3 *et seq.*
2. Improved Yellow Dent (Queensland)	49·6	4 *et seq.*
3. Golden Nugget (New South Wales)	43·5	6
4. Yellow Hogan (New South Wales)	42·5	6
5. Golden Beauty (Queensland)	41·1	6
6. Golden Beauty (New South Wales)	31·9	..

S.E. of a mean treatment yield = 2·29 bushels per acre. Differences exceeding 3 S E. or 6·87 bushels per acre are significant.

Mean = 43·3 bushels per acre. Significant difference = 15·8 per cent. of mean.

Period 1925-26 to 1931-32 (7 Seasons.)

Variety.	Bushels per Acre.	Significantly Exceeds.
1. Improved Yellow Dent (Queensland)	47·1	3 *et seq.*
2. Fitzroy (New South Wales)	45·7	3 *et seq.*
3. Golden Nugget (New South Wales) .. .	40·5	..
4. Yellow Hogan (New South Wales) .. .	39·5	..
5. Golden Beauty (Queensland)	38·1	..

S.E. of a mean treatment yield = 1·64 bushels per acre.
Differences exceeding 3 S E. or 4.91 bushels per acre are significant.
Mean = 42·2 bushels per acre. Significant difference = 11.6 per cent. of mean.

Period 1925-26 to 1932-33 (8 Seasons.)

Variety.	Bushels per Acre.	Significantly Exceeds.
1. Improved Yellow Dent (Queensland)	48·6	3
2. Fitzroy (New South Wales)	47·5	3
3. Golden Nugget (New South Wales)	41·7	..

S.E. of a mean treatment yield = 1·02 bushels per acre.
Differences exceeding 3 S.E. or 3·05 bushels per acre are significant.
Mean = 45·9 bushels per acre. Significant difference = 6.7 per cent. of mean.

Period 1928-29 to 1929-30 (2 Seasons.)

Variety.	Bushels per Acre.	Significantly Exceeds.
1. Fitzroy (New South Wales)	65·75	8 *et seq.*
2. Improved Yellow Dent (Queensland)	63·75	11 *et seq.*
3. Leaming (New South Wales)	63·25	11 *et seq.*
4. Fitzroy (College)	62·85	11 *et seq.*
5. Improved Yellow Dent (College)	60·75	12
6. Golden Nugget (New South Wales)	60·3	12
7. Yellow Hogan (New South Wales)	57·9	12
8. Golden Beauty (Queensland)	57·35	12
9. Hickory King (New South Wales)	57·25	12
10. Giant White (New South Wales)	56·25	12
11. Manning Silvermine (New South Wales) ..	53·75	12
12. Golden Beauty (New South Wales)	42·8	..

S.E. of a mean treatment yield = 2·71 bushels per acre.
Differences exceeding 3 S.E. or 8·14 bushels per acre are significant.
Mean = 58·5 bushels per acre. Significant difference = 13·9 per cent. of mean.

Period 1928-29 to 1930-31 (3 Seasons.)

Variety.	Bushels per Acre.	Significantly Exceeds.
1. Leaming (New South Wales)	60·9	8 *et seq.*
2. Fitzroy (New South Wales)	60·16	9 *et seq.*
3. Improved Yellow Dent (Queensland)	59·5	10
4. Fitzroy (College)	57·6	..
5. Improved Yellow Dent (College)	57·3	..
6. Golden Nugget (New South Wales)	55·6	..
7. Yellow Hogan (New South Wales)	54·8	..
8. Golden Beauty (Queensland)	53·2	..
9. Hickory King (New South Wales)	52·9	..
10. Giant White (New South Wales)	51·4	..

S.E. of a mean treatment yield = 2·36 bushels per acre.

Differences exceeding 3 S.E. or 7·08 bushels per acre are significant.

Mean = 56·34 bushels per acre. Significant difference = 12·5 per cent. of mean.

Period 1928-29 to 1931-32 (4 Seasons.)

Variety.	Bushels per Acre.	Significantly Exceeds.
1. Improved Yellow Dent (Queensland)	52·3	5 *et seq.*
2. Leaming (New South Wales)	52·15	6 *et seq.*
3 Fitzroy (College)	49·4	8 *et seq.*
4. Fitzroy (New South Wales)	48·7	9
5. Golden Nugget (New South Wales)	46·7	..
6. Yellow Hogan (New South Wales)	45·0	..
7. Golden Beauty (Queensland)	44·0	..
8. Hickory King (New South Wales)	43·3	..
9. Giant White (New South Wales)	42·45	..

S.E. of a mean treatment yield = 1·82 bushels per acre

Differences exceeding 3 S.E. or 5·47 bushels per acre are significant.

Mean = 4·71 bushels per acre. Significant difference = 11·6 per cent. of mean.

Period 1928-29 to 1932-33 (5 Seasons.)

Variety.	Bushels per Acre.	Significantly Exceeds.
1. Improved Yellow Dent (Queensland)	52·6	..
2. Leaming (New South Wales)	51·7	..
3. Fitzroy (College)	50·1	..
4. Fitzroy (New South Wales)	49·8	..
5. Golden Nugget (New South Wales)	46·5	..

Fisher's " Z " test showed no significance in the results.

Period 1930-31 to 1932-33 (3 Seasons.)

Variety.	Bushels per Acre.	Significantly Exceeds.
1. Improved Yellow Dent (Queensland)	45·1	..
2. Leaming (New South Wales)	43·9	..
3. Fitzroy (College)	41·5	..
4. Fitzroy (New South Wales)	39·3	..
5. Golden Nugget (New South Wales)	37·2	..
6. Kennedy (New South Wales)	33·3	..
7. Golden Superb (New South Wales)	30·4	..

Fisher's "Z" test showed that no differences were significant.

Summary of Composite Results.

The composite results may be summarised as under, significant differences only being included:—

Variety.	Superior to.	Inferior to.
1. Improved Yellow Dent (Queensland)	6–13	..
2. Fitzroy (New South Wales)	6–13	..
3. Leaming (New South Wales)	8–13	..
4. Fitzroy (College)	10–13	..
5. Improved Yellow Dent (College)	13	..
6. Red Hogan (College)	..	1, 2
7. Golden Nugget (New South Wales)	13	1, 2
8. Yellow Hogan (New South Wales)	13	1, 2, 3
9. Golden Beauty (Queensland)	13	1, 2, 3
10. Hickory King (New South Wales)	13	1–4
11. Giant White (New South Wales)	13	1–4
12. Manning Silvermine (New South Wales) ..	13	1–4
13 Golden Beauty (New South Wales)	..	1 -5, 7–12

Discussion.

The results bring out clearly the need for replication over a number of seasons, and the danger of basing conclusions on the results of a single trial. Thus in 1931-32, a drought year, Fitzroy (New South Wales) came last, being significantly inferior to six other varieties, yet in the majority of seasons it has occupied a high place, and it is shown by a study of the composite results to be one of our most valuable varieties. Golden Nugget provides a similar case.

Another point of importance is the increased refinement in selection made possible when the trials are continued for several years. Thus for the composite results for the years 1925-26 and onwards it is seen that with trials over the first three years only differences of 24 per cent. of the mean can be adjudged significant. Over five years a difference of 15·8 per cent. of the mean is significant, over seven years 11·6 per cent., and over eight years 6·7 per cent. In other words, over the first three years only a difference of 8 bushels per acre is significant, over five years 6·87, over seven years 4·9, and over eight years 3·05 bushels per acre.

In the course of time new varieties were introduced into the trials, and those varieties which were proved inferior were from time to time discarded. After 1927-28, Red Hogan, although doing reasonably well, was discarded on account of commercial prejudice against its colour, and partly because of its starchiness and its being somewhat susceptible

to weevil. Golden Beauty (New South Wales) had by 1930 been definitely proved unsuitable, and Manning Silvermine was discarded at the same time. By 1932 the Queensland strain of Golden Beauty, together with Yellow Hogan, Giant White, and Hickory King, had proved their inferiority under Lockyer conditions, and these varieties were accordingly deleted. Improved Yellow Dent was not grown as a College farm crop after 1931, so that it became impossible to continue this variety for lack of seed.

Conclusions.

1. Improved Yellow Dent, Fitzroy, and Leaming prove to be the outstanding varieties (of those so far tested) for Lockyer Valley conditions. It is to be noted that of these the former two are late types, while Leaming is a mid-season variety.

2. Golden Nugget is also good, but slightly inferior to these three.

3. The varieties Red Hogan, Yellow Hogan, and Golden Beauty give fair yields, but are definitely inferior to the first three.

4. The strain of Golden Beauty, sold by the New South Wales Department of Agriculture, is definitely unsuited to the conditions of the Lockyer. Giant White, Manning Silvermine, and Hickory King are also inferior, and none of these varieties can be recommended for such districts as the Lockyer Valley.

5. The value of the varieties Kennedy, Golden Superb, and Red Nib has not yet been proved, and no recommendation can at present be made with regard to them.

6. It must be emphasised that these results are applicable only to the Lockyer Valley and to districts having similar soils and climatic conditions.

Other varieties are now under test, and in the season 1933-34 the varieties Funk's 90-Day and Durum are being added to the eight tested in 1932-33. The trials will be continued from year to year, and progressive results published when possible.

Acknowledgments.

The authors wish to express their gratitude to Professor J. K. Murray for his keen interest throughout the work and for his ready provision of facilities to carry it out. The bulk of the field work was ably done by Mr. E. McCarthy, Assistant to Plant Breeder. To the various assistants in the Plant Breeding Section who have from time to time assisted in various ways we also tender our thanks.

Thanks are also due to the State Departments of Agriculture of Queensland and New South Wales for having made the necessary supplies of seed available.

REFERENCES.

1. R. A. Fisher and J. Wishart. Imp. Bur. Soil Sci. Tech. Comm. No. 10.

2. E. J. Maskell. Trop. Agr. Vol. 5, No. 12; Vol. 6, Nos. 1, 2, 4.

NOTE.—Supplies of pure seed of Improved Yellow Dent may be obtained from the Department of Agriculture and Stock, Brisbane, and of Fitzroy from the Queensland Agricultural High School and College, Gatton.

Red maize is definitely unsuitable for export requirements, and there is also prejudice against it in local markets. In view of these facts and also on account of the proved superiority of yellow maize in these trials, the discontinuance of the use of red-grained types and the extension of the use of yellow types is strongly recommended.

QUEENSLAND VENEER TIMBERS.

More than twenty timbers in all shades of ornate colour and variety of figuring are available within the State for veneer and plywood purposes of all kinds, while the efficiency of the factories is such that the humblest cottage can be made beautiful by the use of choice veneered panels at low cost.

Such a natural advantage as this, coupled with the variety of native hardwoods of unexcelled durability eminently suitable for exterior sheetings and polished internal floorings, may well make home builders in other lands envious of their friends in Queensland.

In addition to work provided for timber and transport workers, the Queensland Veneer and Plywood Industry in 1933 provided direct employment for 448 hands in its factories.

Although the industry is only eighteen years old in this State, the capital invested has already grown to £370,000, and Queensland factories are now capable of supplying more than the present demand of the whole of the Australian States and New Zealand.

The following notes on Queensland veneer timbers, taken from a brochure entitled "The Veneer and Plywood Industry of Queensland," published by the Sub-Department of Forestry, Department of Public Lands, Queensland, will be read with interest by farmers and others who appreciate the economic value of Queensland woods. The fine plates illustrating this article are also reproduced through the courtesy of the Sub-Department of Forestry.

QUEENSLAND possesses a range of valuable veneer woods, which for beauty and utility are unsurpassed in any country of the world.

Many of the most famous cabinetwoods of the Old and New World are being replaced by Queensland woods of similar colour, figure, and lustre, capable of giving equal service under the most exacting conditions.

Foremost among these are Queensland Walnut, which is often almost identical in appearance to the best Italian and American Walnut, Maple Silkwood, a Mahogany type, and Silky Oak, the quartered figure of which surpasses that of the European Oaks while offering much greater facilities for working.

Ripple figured quarter sliced veneers of Queensland Satinay remind one strongly of figured Mahogany, while rotary-peeled Red Tulip Oak shows a particularly handsome soft tissue figure of tapestry effect which has no parallel in any other known wood.

Hoop Pine is the standard Queensland timber for all plywoods for plain joinery work, and is most largely used for the internal plies and cores of all types.

Following are short descriptions of the more important veneer woods in Queensland with particular reference to their botanical and trade nomenclature, sources of supply and log size, timber qualities, and uses.

QUEENSLAND WALNUT.

(*Endiandra palmerstoni.*)

The close resemblance of this wood to the Walnuts of the Northern Hemisphere gained for it the names of Queensland Walnut and Black Walnut from the date of its first discovery.

In the American trade, it became known variously as Australian, Oriental, and Queensland Walnut, Australian Laurel, and Oriental Wood, the last name being finally adopted by the Federal Trade Commission for the sole use of the trade in the United States.

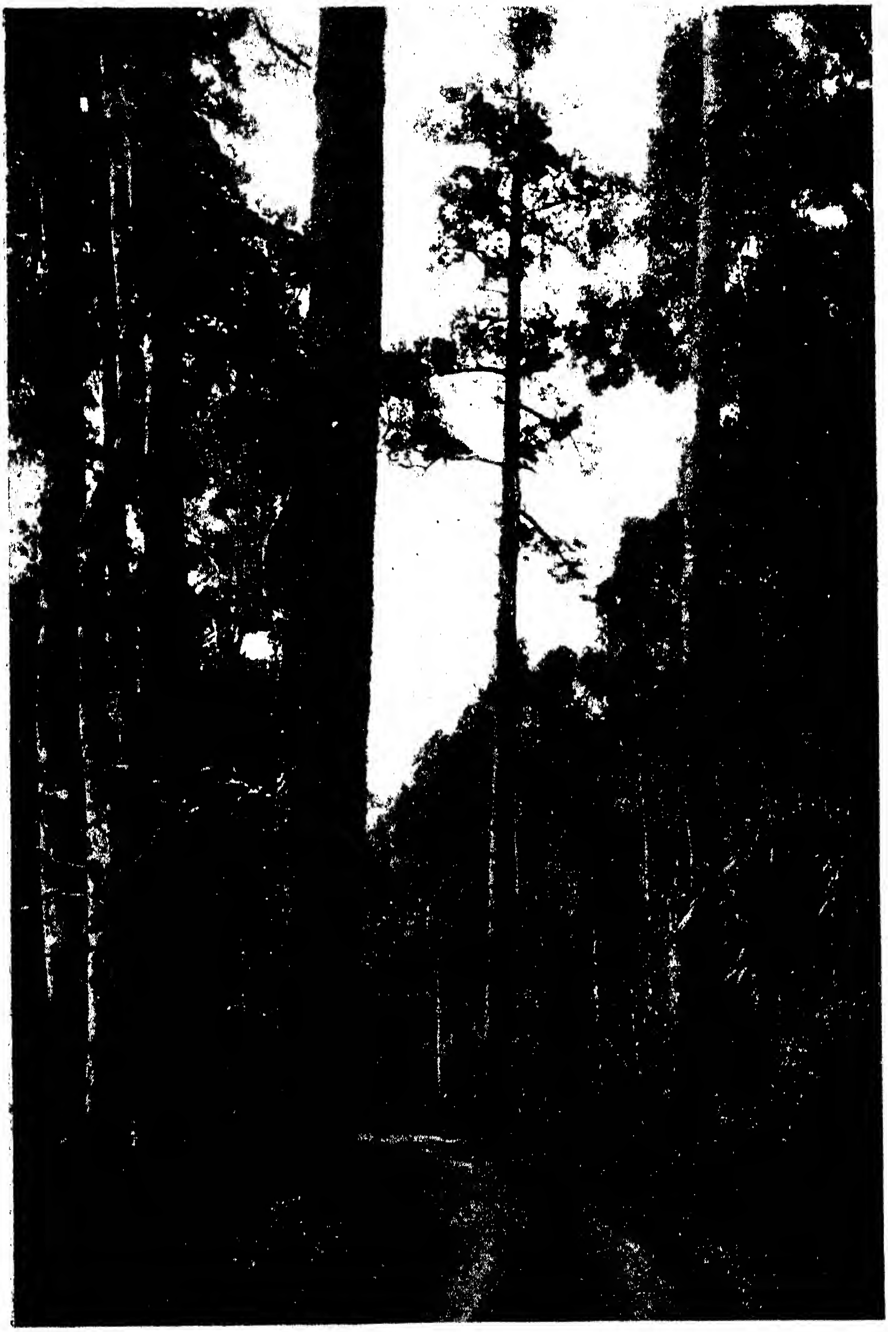

Plate 43.—Veneer Logs in Hoop Pine Forest, South Queensland.

Walnut is one of the largest of Queensland trees, and is available only on the coastal Tablelands of North Queensland from Innisfail to Atherton, with Cairns as the port of shipment.

Mature trees attain a height of 120 to 140 feet, yielding boles up to 80 feet in length. Logs are sold in six classes ranging in measurement from 8 feet to 13 feet and over, centre girth under bark. They are not always, however, perfectly sound.

PLATE 44.—QUEENSLAND WALNUT, 9-FEET GIRTH (BREAST-HIGH), NORTH QUEENSLAND.

It has been estimated that some 40,000,000 superficial feet of Walnut logs are available in North Queensland.

Queensland Forest Service records show that Walnut was first recommended for veneering work in 1917. In February, 1922, the first veneering was done in Queensland by Messrs. D. G. Brims Limited, at Milton, on a log specially obtained from Atherton. The timber was found to peel exceptionally well for rotary-cut veneer, although dulling the knife edges a little more than other woods. Standard

sheets of three-ply were exhibited in the British Empire Exhibition, and the remainder were used for panelling the old Forest Products Showroom in William street, and for trade samples. The possibilities of Walnut were recognised by the Forest Service, and a strong publicity campaign was inaugurated. From this modest beginning developed the present overseas demand for this timber.

By 1925 a number of Walnut logs had been sold to local plywood manufacturers, but the plywood did not at once become popular, notwithstanding its attractive figure. Plywood made in Brisbane was at first all of the rotary type, and no

PLATE 45.—QUEENSLAND MAPLE, 10-FEET GIRTH (BREAST-HIGH).

attempt was made to obtain the still more beautifully striped or rippled figure by the cutting of the veneers radially by a slicing machine. In Sydney, however, Messrs. Beale and Company used sliced veneers with excellent effect on Australian-made pianos and furniture panels.

Towards the end of 1927 a strong demand for Walnut logs arose in America, which had the effect of greatly reviving the timber trade in North Queensland

after months of depression. By March, 1928, more than 300,000 superficial feet of logs had been shipped to American veneering works. Here it was sold chiefly as Oriental Walnut, later becoming known also as Australian and Queensland Walnut, and from its family (Lauraceæ) Australian Laurel.

Strong objections were raised to the use of the name "Walnut" for the timber by the American Walnut Association, who contended that it was not a true Walnut. There is little doubt that this objection was due to the very successful competition of the Queensland wood for the same purposes as the American Walnut (*Juglans nigra*) which it strongly resembles.

PLATE 46.—SILKY OAK TREE (CARRYING FERNS) IN NORTH QUEENSLAND FOREST.

It was finally decided by the American Trade Commission that the wood must be sold only as Oriental Wood in the United States.

From July, 1928, the demand for Walnut logs greatly increased, and up to the end of the year over 2,000,000 superficial feet were exported to America alone. For the first six months of 1929 the quantity exported to America was 2,808,000 superficial feet, valued at £49,000 at the point of shipment. Exports were made chiefly to America, the United Kingdom, Canada, France, and Germany in order of quantity.

For the year July, 1931, to June, 1932, Queensland Forest Service records show that 1,296,000 superficial feet (Hoppus) of Walnut logs were removed from Crown lands in North Queensland. This represents an increase of 60 per cent. on the Crown sales for 1930-31.

In 1932-33, 560,000 superficial feet were sold.

Under the name of Australian or Oriental "Walnut" the following extracts are taken from Tropical Woods (1st June, 1929) as published by the Yale University, United States of America:—

> "The most recent addition to the American market of so-called Walnut woods is from Queensland, Australia. It appears to have been first introduced in 1927, by Russell Fortune, of Indianapolis, Ind., and has since become a serious competitor of American Walnut. It is known to the trade as Oriental Walnut, Oriental wood, Australian Walnut, Australian Laurel, and Queenswood.
>
> "The Imperial Institute (Descriptive List of some Empire Timbers, London, 1928, pp. 11-12) reports as follows:—'Queensland Walnut—A moderately heavy timber of a pale chocolate-brown colour, somewhat open in the grain and often presenting a fine wavy figure; a streaked figure sometimes occurs. The wood seasons rapidly, works well under the tool, planes to a smooth surface, and takes a good finish and polish. Weight 46 lb. per cubic foot. An excellent substitute for American Walnut. It is well suited for high-class furniture, cabinetwork, joinery, and interior decorative purposes, and is suggested for the manufacture of aircraft propellers. The streaked timber is valued for veneer, which is well suited for shopwindow and other panelling. Queensland Walnut would be useful for many purposes where a strong timber of good appearance is required.'
>
> "Mr. Karl Schmieg, recognised authority on cabinet-making and design, says:—'Queenswood (i.e., Queensland Walnut) is a remarkably fine wood, which runs very sound and uniform, keeps straight, takes glue well, and can be readily stained and polished. It has a greenish-yellow tinge and dark stripes, suggesting French Walnut more than the others, and is appropriate for use in combination with Ash, Oak, or any kind of Walnut. We have not used it in solid lumber, but have recently made a modern bedroom set to serve as a model for four hundred others for a hotel, and all of the surfaces, such as end panels, tops, and drawer fronts, are of Queensland veneer. I consider the wood suitable for modern interiors of offices, clubs, and hotels. The price at present is very reasonable.' "

A member of the American Walnut Manufacturers' Association made the following remarks regarding Queensland Walnut logs shipped to America:—

> " The logs are very striking in appearance, most of them from 14 to 16 feet long and running in diameter of from 30 inches to 40 inches. The bark has the appearance of Beech bark, except that it is reddish rather than grey. The sapwood is tremendous, the ring running from 2 inches to 3 inches wide. The sapwood is of a pinkish colour, and no way has been found to use it.
>
> "Forty to fifty per cent. of the logs show some kind of a figure. There is a great variation in this figure, but a mottle cross figure is not uncommon. When the plain wood is quartered, it produces a striped figure, not unlike the stripe to be obtained from American Walnut. It is this type of wood that has been in greatest demand, since much greater width quarters can be obtained from these large logs than from American Walnut.
>
> "Its advantages are that the veneers come wide and long; therefore can be used with the least possible waste. It is also economical from the standpoint of price."

The dark-striped "Walnut" figuring of Queensland Walnut seen most prominently in quarter-sliced veneers is due to decided variations in the depth of colour in the concentric growth rings of the trunk.

Mottled, fiddleback, and ripple figuring are the result of the interlocking of the wood fibres, and show the best effects in quartered veneers.

The following excellent description of this beautiful wood is taken from a publication issued by an American veneer manufacturer:—

> "Very few commercial woods exhibit such a variety of attractive colours as this native of Queensland's forest. While there are many odd shades, difficult to briefly describe, the most prominent are the 'Salmon Red,' the 'Walnut tint,' and a third group ranging from grey to brown. In spite of the extreme variations of shades afforded by individual specimens, the logs are massive and, as previously stated, produce a large amount of veneer, rendering it easy to procure uniformly coloured material, even for large dimensioned wood work.
>
> "Although the Oriental wood can be worked advantageously on the rotary lathe, the grain of the wood favours it being cut on the quarter. The figure thus produced consists of more or less parallel stripes of varying width which are often interrupted by rich cross figures of different types, the most common of which are the 'fiddleback,' 'broken roe,' 'mottle,' and 'finger roll' markings."

PLATE 47.—SNIGGING VENEER LOGS WITH TRACTOR IN A NORTH QUEENSLAND FOREST.

The use of Queensland Walnut veneered panelling, under the name of "Oriental" Walnut, in the carriages of the famous European tourist train "Golden Arrow" is a striking tribute to the beauty and utility of this valuable wood. This train is reputed to be the most luxurious in the world.

A considerable amount of veneering and panelling work in Queensland Walnut has also been carried out at the headquarters of the British Broadcasting Corporation.

PLATE 48.—TWO RED TULIP OAKS, 9-FEET GIRTH (BREAST-HIGH), NORTH QUEENSLAND.

In Australia, Walnut veneered panels are used largely in the construction of high-class furniture, radio cabinets, and for the wall panelling of the best homes and public buildings. It has been used to an increasing extent in recent years with excellent effect in panelling the principal rooms of modern homes erected in Brisbane under the supervision of leading architects. For the best work quarter-sliced matched panels are most favoured.

MAPLE SILKWOOD.

(*Flindersia brayleyana* and *Flindersia pimenteliana.*)

Two distinct botanical identities are included under the official name Maple Silkwood, but the timbers are so similar with regard to colour, figure, and working qualities that they are grouped together for trade purposes. In North Queensland, *Flindersia brayleyana*, once called Red Beech, is now commonly known as Queensland Maple, while *Flindersia pimenteliana* is called Silkwood.

In the American trade the timber has been called Warri Wood.

Maple Silkwood grows only on the tablelands and coastal areas of the Atherton district in North Queensland. Both species attain a height of over 100 feet and logs are sold with girths ranging from 6 feet to over 14 feet measured under the bark at the centre. *Flindersia pimenteliana* usually produces a slimmer bole and is much less abundant.

The latest estimates of the quantity of Maple Silkwood available on Crown lands in North Queensland (December, 1929) are:—

Girth 8 feet and over (breast high) ..	77,000,000 superficial feet
Girth 5 feet to 8 feet	30,000,000 superficial feet
Total	107,000,000 superficial feet

To enable a sustained supply of this valuable timber to be secured for the future, the annual cut from Crown lands was regulated to 3,000,000 superficial feet for the three years from January, 1930, to January, 1933, but these limits were not reached by sales during this period. The minimum girths cut were 9 feet on the Tableland and 8 feet on the Coast and Molloy areas. Nearly 8,000,000 superficial feet of logs were cut on Crown lands during the five and a-half years period from January, 1924, to June, 1929, and nearly 3,500,000 superficial feet were cut in three years from July, 1929, to June, 1932.

The Department's policy of reforestation of this species will perpetuate supplies of Maple Silkwood.

Maple Silkwood is recognised as the finest cabinetwood in Australia. The wood has a pleasing flesh-pink colour with the lustre of satin. Quarter-sliced veneers almost always show a ribbon figure. The broken ribbon and ripple figuring found in butt veneers are particularly beautiful, having the appearance of shot silk. The best veneers are obtained from stumps, butt logs, and crotches of well-matured trees.

Maple Silkwood ranks as one of the best veneer woods of the world. It cuts cleanly without splitting and very wide and thin veneers can be successfully sliced.

The wood is very tough, and is almost equal in strength to English Oak.

Tests made by the Technological Museum, Sydney, on seasoned timber, gave the following results:—

Weight per cubic foot—37 lb.
Modulus of Rupture—13,300 lb. per square inch.
Modulus of Elasticity—1,649,000 lb. per square inch.

The average weight of seasoned timber is approximately 40 lb. per cubic foot.

Maple Silkwood responds readily to ammonia fuming, turning to attractive grey tones while enhancing the natural figuring.

For interior work it is very durable, and is prized for veneered furniture, panelling, doors, shop and office fittings, and joinery generally.

The beautiful symmetrical effects obtainable by the use of veneers of figured Maple Silkwood are well illustrated by the panelled work in the Board Room at the Headquarters of the National Society of Operative Printers and Assistants, Borough road, London.

In Australia Maple Silkwood matched panels are extensively used in the manufacture of the best furniture, where it is used for table tops, sideboard and wardrobe front panels and ends, dressing-table drawer fronts, and bedstead ends.

Maple Silkwood plywood is eminently suitable for aircraft work for which it is classed with Honduras Mahogany. Made to exacting specifications, Maple Silkwood plywood is utilised in wing and body sheeting, body bulkheads, and cabin furniture.

Plate 49.—Satinay Forest, Fraser Island, Queensland.

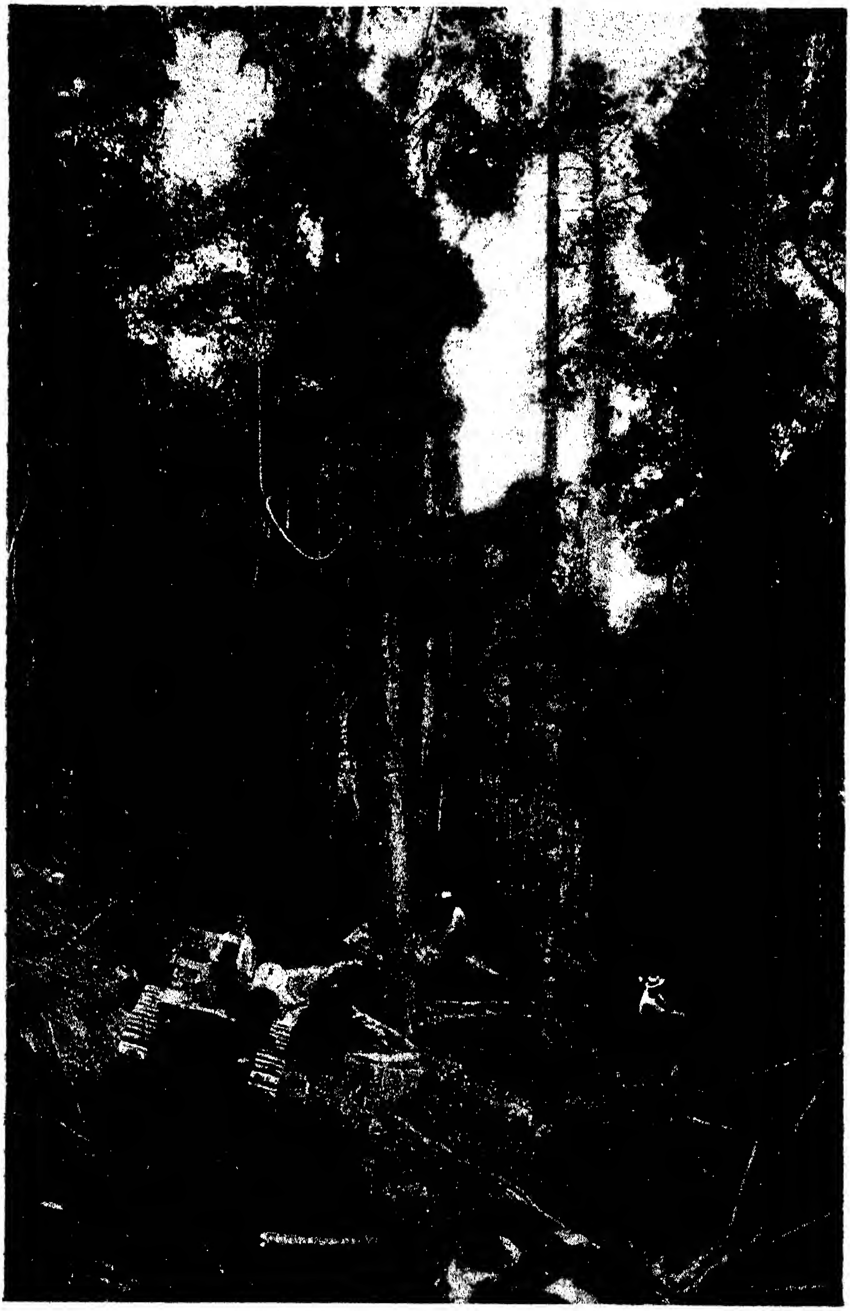

PLATE 50.—TRACTOR LOGGING IN HOOP PINE FOREST, CANUNGRA DISTRICT.

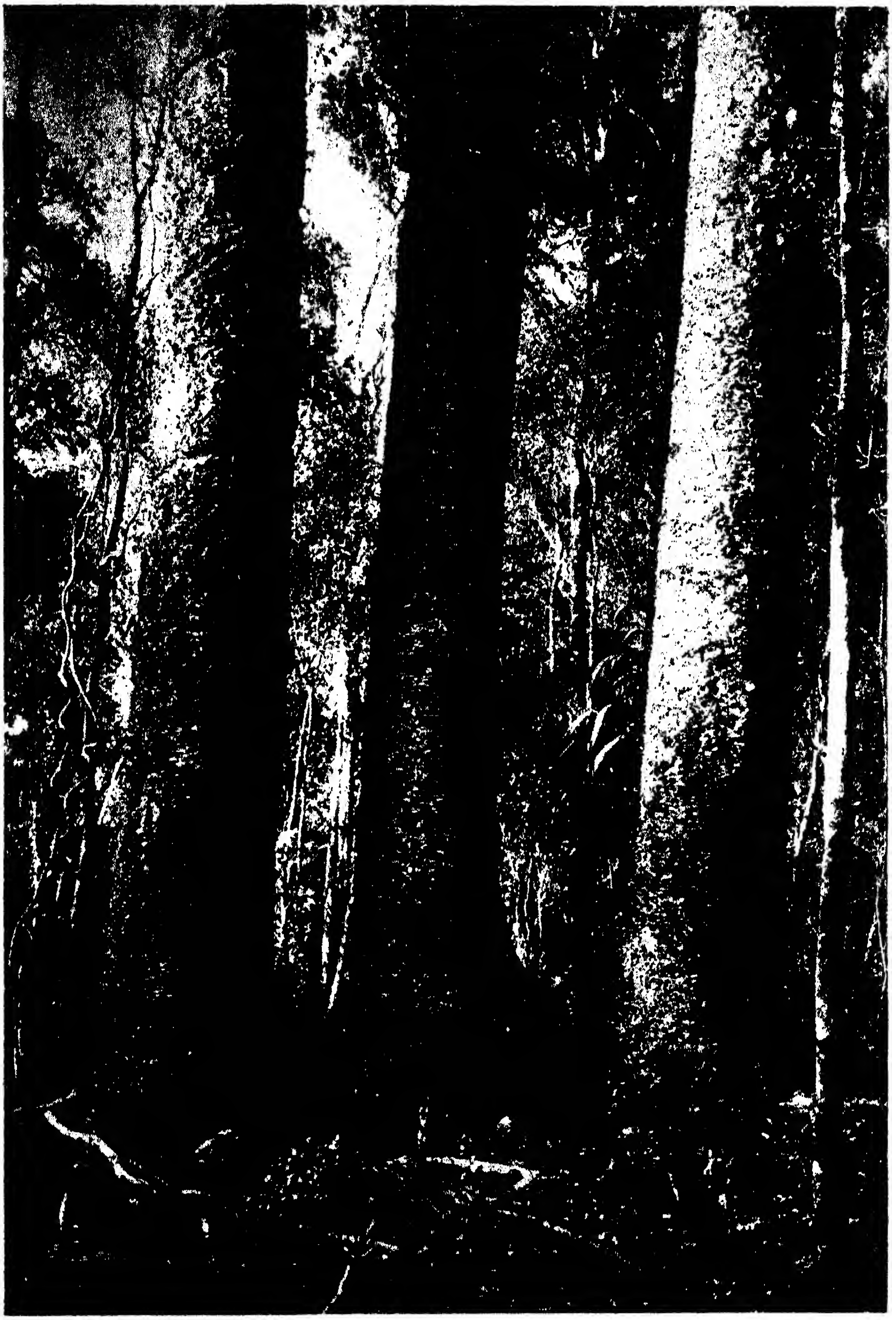

PLATE 51.—"THE TRIPLETS."
Hoop Pines at Cainbable, Sarabah Range, South Queensland.

SILKY OAK.

(*Cardwellia sublimis.*)

The original Silky Oak of the Australian market was produced by two species (*Orites excelsa* and *Grevillea robusta*) occurring in the coastal areas of Southern Queensland and Northern New South Wales, but the North Queensland species (*Cardwellia sublimis*), is the Silky Oak of the veneer trade.

The three species, although somewhat alike in appearance and belonging to the same family, have different properties, the Northern species being superior for veneer purposes and providing the best logs.

Silky Oak (*Cardwellia sublimis*) is the largest tree of its family and is found only in the coastal areas in the vicinity of Innisfail and Cairns, North Queensland. The tree reaches a total height of 120 feet and its massive bole provides logs up to 10 feet and more in girth. The tree first known as Silky Oak in North Queensland was *Embothrium wickhamii* of the same family, and the present Silky Oak of the furniture trade was then more commonly called Bull Oak.

In America it is known as Lacewood, probably because of the lace-like appearance of rotary-cut veneers.

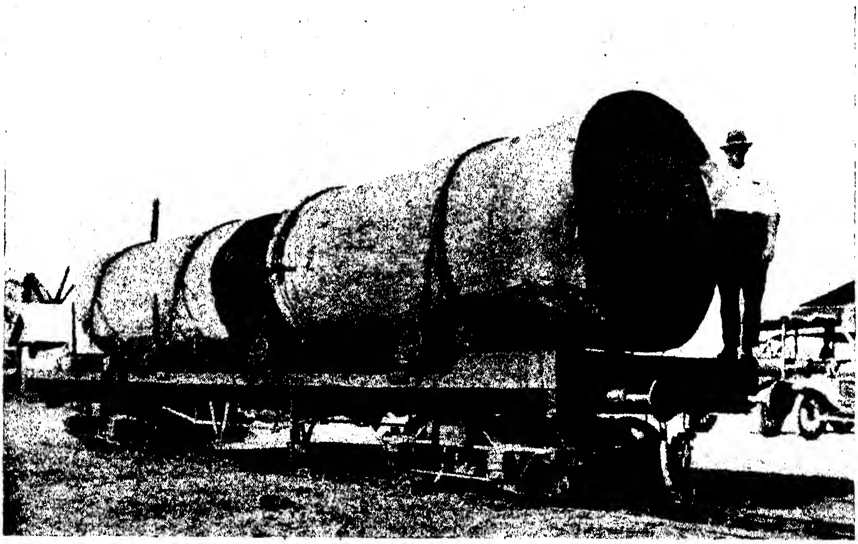

PLATE 52.—KAURI PINE LOGS.

The most recent estimate gives the quantity of Silky Oak log timber available on Crown lands in North Queensland as 105,000,000 superficial feet (Hoppus) of which 70,000,000 superficial feet is in logs measuring 8 feet and over in girth.

To provide for the future requirements of the timber industry while trees growing under sylvical operations attain milling size, the Queensland Forest Service in January, 1930, limited the annual log cut for a period of three years to 2,000,000 superficial feet. For the year 1932-33 998,000 superficial feet were sold by the Crown.

Customs figures for Queensland for 1932 show that 576,000 superficial feet of sawn Silky Oak were exported to United Kingdom alone during the year. This indicates that this timber is gaining in popularity abroad, and the greater use of veneered panels is following in the wake of the increased demand for sawn timber.

Silky Oak is second only to Maple Silkwood in popular esteem for cabinet purposes in Australia.

The timber is light and of a pale-pink colour, and owes its popularity chiefly to its ease of working and facility for staining coupled with its handsome "Oak" figuring, which can be varied by the angle of cutting with regard to its large medullary rays. The most striking "silver grain" is seen on quarter-sliced veneers.

When thoroughly seasoned, the wood has an average weight of 36 lb. per cubic foot.

Silky Oak is very tough for its weight and is excellent for holding screws. It takes glue readily but does not fume. On account of the weaving of the fibres through the large rays the transverse strength is considerably lower than that of Maple Silkwood, although ample for joinery and furniture purposes. The modulus of rupture averages about 8,000 lb. per square inch for good quality seasoned timber.

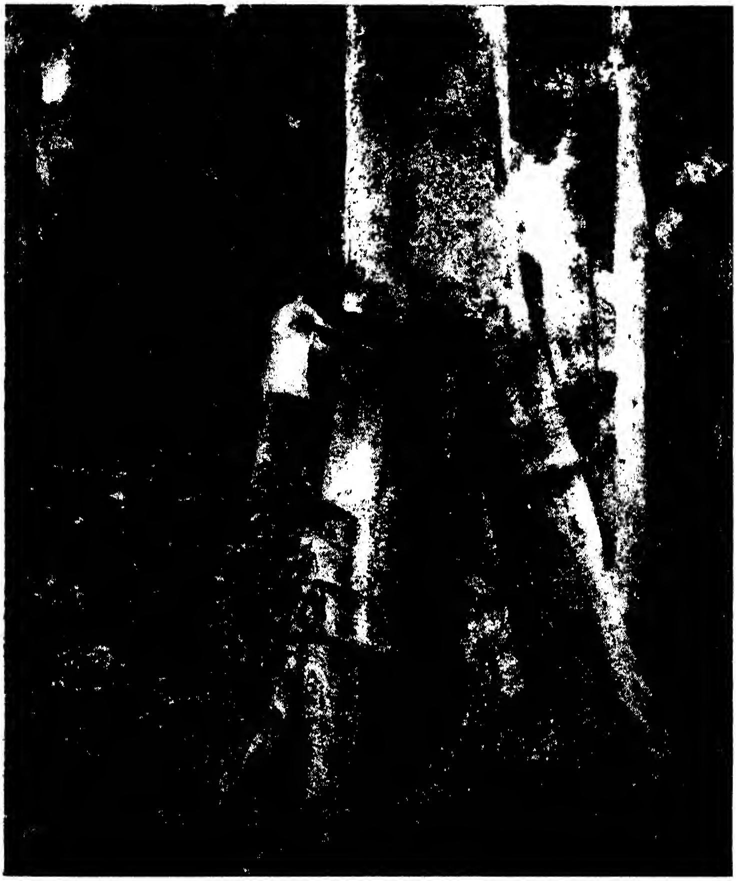

Plate 53.—Scarfing a Walnut Tree, 11-feet Girth, Atherton District.
Ripple Marks on Buttresses Indicate Figured Wood.

The wood is very durable even when exposed to the weather, and is a general favourite for casement windows which are usually oiled and varnished on the inside to show the attractive grain.

Silky Oak is well suited for veneering owing to its toughness and flexibility and the wide sheets which can be secured. Veneer sheets leave the knife smooth cut and free from checks.

Silky Oak plywood is extensively used for panelling in the best residences and in public banks, shops, and offices. It is also favoured for partitions, counters, and showcases.

In the furniture trade it finds extensive uses in wardrobes, sideboards, table tops, and other articles framed in solid timber.

Much of the beauty of Silky Oak is often lost through incorrect methods of finishing. Judicious staining is necessary to bring up the natural figuring to the best effect.

PLATE 54.—ROSE ALDER, NORTH QUEENSLAND.

RED TULIP OAK.

(*Tarrietia argyrodendron* var. *peralata.*)

Red Tulip Oak represents the largest and most valuable tree of the Sterculiaceæ family in Australia. It is a native of the tropical coastal forests of North Queensland, where it occurs on the Atherton Plateau and northward along the ranges towards the Daintree River. The tree reaches a height of 120 feet with a bole sometimes exceeding 10 feet in girth above its widely spurred base.

Above the spurs, excellent logs for rotary veneering are usually available, the trunk being long, straight, and cylindrical in shape.

Logs in girths ranging from 7 feet upwards are sold by the Forest Service f.o.b. or f.o.r. Cairns. The total quantity of log timber in North Queensland available for marketing has been estimated at more than 200,000,000 superficial feet.

It has been found from experience that the best logs for veneering are those containing light, mild timber, cut on sheltered sites. Production of low-grade veneers has resulted from the cutting in error of the harder allied woods, Brown Tulip Oak (*Tarrietia argyrodendron*) and Blush Tulip Oak (*Tarrietia actinophylla*).

Red Tulip Oak is a handsome veneer timber with colour variations in brown and reddish shades. During 1932 it became the most popular wood for the internal panelling of modern Brisbane homes. For this work rotary-peeled plywood gives the most attractive results because of the beautiful tracery effect of the concentric bands of soft tissue prominently exposed on this section.

PLATE 55.—SILVER ASH VENEER LOG IN A NORTH QUEENSLAND JUNGLE.

Quarter-sliced veneers show the comparatively large medullary rays to the best advantage, but the general effect of the figuring is not so pleasing as that secured by rotary peeling.

Red Tulip Oak is a comparatively hard wood and has an average seasoned weight of approximately 50 lb. per cubic foot.

It is very strong and makes particularly strong plywood. A remarkable feature of the wood is its extremely high electrical insulating properties. Under test, rods 4 inches long have withstood a pressure of 33,000 volts for two minutes before failure.

For interior work Red Tulip Oak is very durable and gives long and satisfactory service. It is not adapted for exposure to the weather.

PLATE 56.—BLACK BEAN, 10 FEET IN GIRTH, ATHERTON DISTRICT, NORTH QUEENSLAND.

Red Tulip Oak plywood is at present used chiefly for decorative panelling of private residences, and for shop and office fittings.

Where plywood panelling is used in interiors it is usual to use moulded cover strips, and art rails of the same or some other figured wood to give harmonious results.

Finished in light tones the plywood is regarded as specially suitable for the interior panellings of motor launches.

PRODUCING VENEER LOGS FOR THE FUTURE.

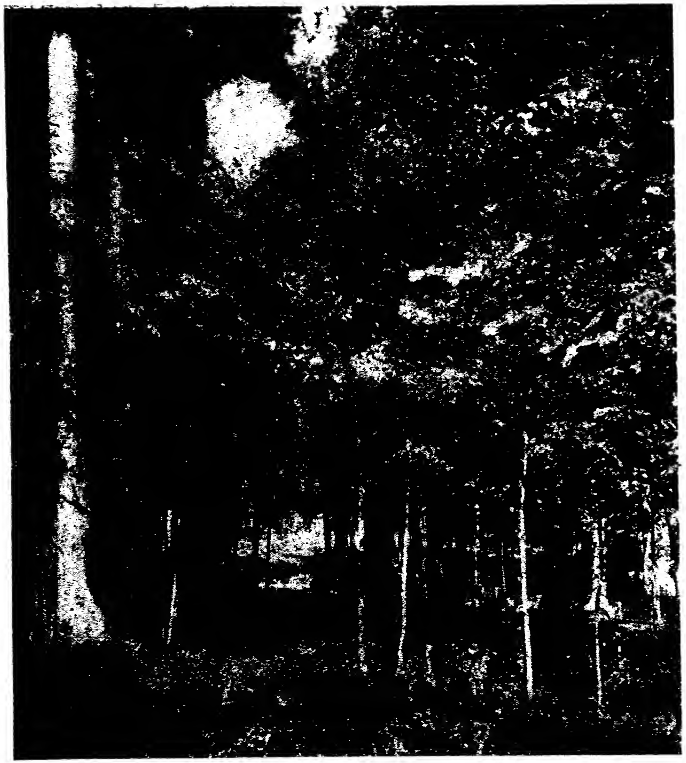

PLATE 57.—QUEENSLAND MAPLE RESULTING FROM NATURAL REGENERATION OPERATIONS.

PLATE 58.—HOOP PINE PLANTATION, TEN YEARS OLD, ATHERTON DISTRICT.

QUEENSLAND SATINAY.

(*Syncarpia hillii.*)

Queensland Satinay has been so named by the Queensland Forest Service because of its resemblance in colour and figuring to the Satiné of French Guiana.

The timber is found in quantity only on Fraser Island, which extends for 80 miles along the Queensland coast, 20 miles east of the port of Maryborough. It prefers the sheltered dells of the immense sandhills forming the backbone of the island, flourishing where the rainfall exceeds 60 inches per annum.

Forest Service field estimates place the available supplies at around 50,000,000 superficial feet. It grows rapidly, regenerates naturally very readily, and rationed supplies can be maintained in perpetuity. Logs are available in centre girths under bark from 6 to 9 feet and over, but the smaller logs are not subject to pipes and provide lighter and more mellow timber, better suited for veneering.

PLATE 59.—PEELING HOOP PINE LOGS ON ROTARY LATHE.

Queensland Satinay is a bright-pink close textured wood showing a beautiful lustrous broken ripple figuring on quarter-sliced veneers. By means of ammonia fuming the colour may be subdued to a greyish-plum tone, with velvet depths lit up by the ripple grain. Probably the most attractive treatment is the unique effect appropriately named "opal finish," because of the changing colours and light reflections of the undulating fibres produced by viewing the panels from different angles. For this purpose the veneers should be cut on the quarter at least ⅛ inch in thickness. Made up panels are then fumed to dark tones in an airtight chamber and afterwards sanded down about one-sixteenth of an inch or until the natural pink colour of the wood appears, where the fibres lie parallel with the surface and the fuming process has not penetrated so deeply. The variegated effects in colour and shading are then seen. The most brilliant results are obtainable by polishing with transparent French polish. "Opal finish" can only be applied to those rare woods which react chemically with deepening colour under the influence of ammonia fumes, and possess strongly interlocked fibres.

Seasoned Satinay has an average weight of 50 lb. per cubic foot. Timber from less mature trees may fall as low as 46 lb., while the inner flitches of very large logs may weigh up to 56 lb. per cubic foot.

The wood is very strong and Satinay plywood is probably the strongest in Australia.

PLATE 60.—LOG DUMP IN HOOP PINE FOREST, SOUTH QUEENSLAND.

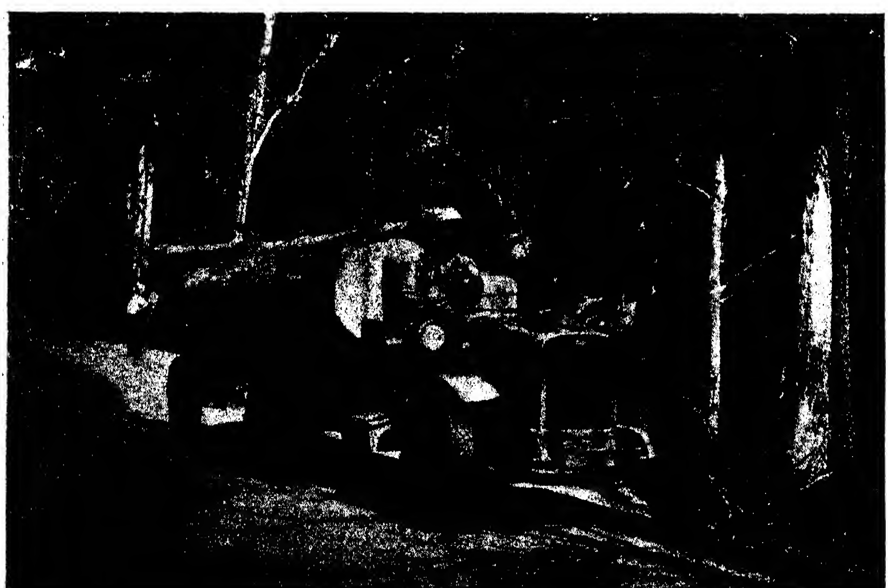

PLATE 61.—PLY LOGS ON THE WAY TO THE MILL.

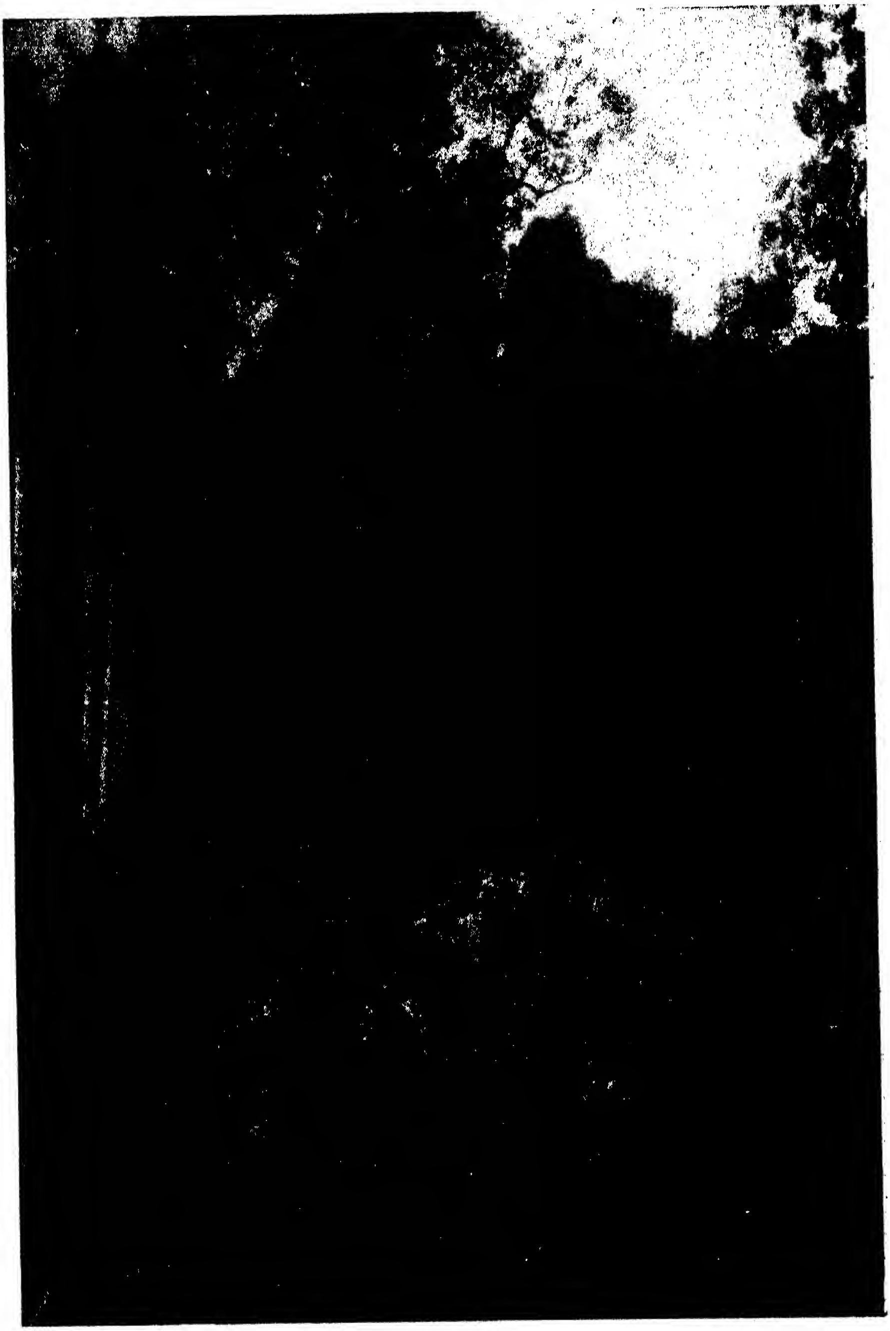

PLATE 62.—HAULING PINE LOGS, IMBIL, SOUTH QUEENSLAND.

Static bending tests made by the Technological Museum, Sydney, showed an average modulus of rupture of 14,800 lb. per square inch for small clear specimens of the wood; with an average compression result parallel to the grain of 7,800 lb. per square inch.

To obtain the easiest cutting of veneers from Satinay, the logs should be sliced as soon as possible after felling, or after thorough boiling. Logs should be greased on the ends immediately after felling to prevent drying and splitting on the ends.

While extremely durable under all conditions, Satinay is also highly fire resistant, ranking first in this respect among all Australian cabinetwoods. Except for the white sapwood, not used in veneers or furniture, Satinay is not attacked by wood borers of any kind.

Satinay veneers, quarter sliced and matched, give excellent effects in wall panelling and for door panels in furniture. Variations in the depth of colour can be obtained by fuming or finishing with the "opal finish" described above. Wall panelling in the Forest Products Showroom, Brisbane, has given splendid service for over five years although exposed to great extremes of heat and humidity. Queensland Satinay has now proved its value for plywood panelling, and its popularity is increasing.

Considerable interest in this timber has recently been shown in America.

QUEENSLAND PINE.

(*Araucaria* spp. and *Agathis* spp.)

Queensland Pine plywood is constructed principally of Hoop Pine (*Araucaria cunninghamii*) with Bunya Pine (*Araucaria bidwillii*) and North Queensland Kauri Pine (*Agathis palmerstoni* and *A. microstachya*) in smaller quantities.

Hoop Pine extends along the whole length of the Queensland coast following the coastal hillsides from the New South Wales border to Cape York, but the largest Queensland supplies are found in the south-eastern corner of the State extending westward about 100 miles to the main Dividing Range. Bunya Pine is not nearly so abundant as Hoop Pine, and has a very restricted range between Gympie and the Bunya Mountains in Southern Queensland. Kauri Pine, as used in the veneer industry grows only in the mountainous coastal area in the Cairns district, North Queensland.

According to present Forest Service estimates the Queensland stand of Hoop and Bunya Pine of mature size (60 inches girth and over) is approximately 800,000,000 superficial feet.

Logs of plywood class represent about 100,000,000 superficial feet of this total.

In North Queensland the quantity of Kauri Pine on Crown lands has been estimated at approximately 125,000,000 superficial feet for trees 8 feet and over in girth breast high. In girths from 5 feet to 8 feet a further 30,000,000 superficial feet are available.

Both the Hoop and Bunya Pines grow to a large size, reaching 150 feet and more in height with girths up to a maximum of 10 feet and more. Although Bunya Pine is usually stouter, both species provide long cylindrical boles, yielding clear logs excellent for veneering purposes.

Kauri Pine reaches much the same height, while providing a much thicker bole from which logs up to 18 feet, and sometimes greater, girth are available. In shape and size Kauri provides the best veneer log in Queensland.

Hoop and Bunya Pine logs are sold in girth classes of 5 feet and upwards, while Kauri logs are rarely sold below 8 feet.

Queensland Pine is a close and even textured, firm cabinetwood of the highest quality. Its ivory colour and smooth finish are particularly attractive to the joiner and cabinet-maker, providing a medium which can be readily stained and finished in any colour desired.

It has considerable toughness and strength but is easily worked, glues and stains perfectly, and is normally non-aromatic.

Seasoned Hoop Pine weighs approximately 36 lb. per cubic foot, while Bunya Pine and North Queensland Kauri Pine average 33 lb. and 30 lb. respectively.

Hoop Pine plywood has the greatest firmness of surface, followed closely by Bunya Pine, with North Queensland Kauri Pine a little softer.

PLATE 63.—KAURI PINE LOGS FROM COOKTOWN, NORTH QUEENSLAND.

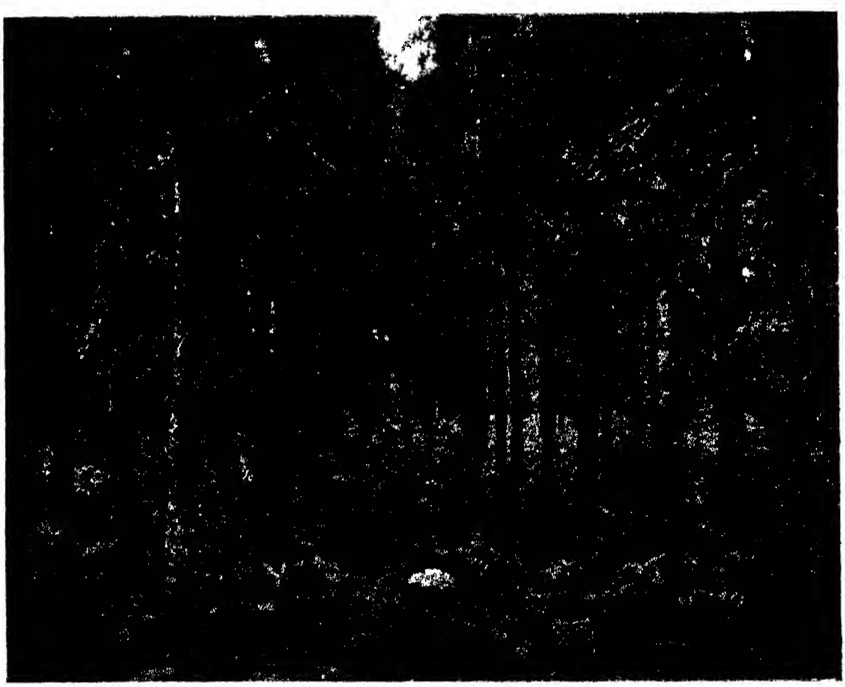

PLATE 64.—PROVIDING FUTURE SUPPLIES FOR THE PLYWOOD INDUSTRY.
Seventeen year old Kauri Pine Plantation, North Queensland.

Plate 65.—Cleaning and Cutting Logs to Length prior to Peeling.

Plate 66.—Log Entering Pit for Steaming before Peeling.

The colour of Hoop Pine is usually uniformly pale, while Bunya Pine frequently shows stronger figuring in pale-pink shades. Kauri is often seen in uniform shades of light-brown. Although unsuitable for outdoor use, these woods are very durable in interior furniture and joinery.

The relative strengths of Hoop and Bunya Pine compared with Oregon Pine (*Pseudotsuga taxifolia*) are given in the following table from Queensland Railway tests:—

Timber.	Number of Tests.	Moisture Content.	Transverse Modulus of Rupture.	Crushing (on end Grain).
		Per Cent.	Lb. per sq. in.	Lb. per sq. in.
Bunya Pine	3	14·6	13,870	7,830
Hoop Pine	7	13·8	12,830	7,620
Oregon Pine	20	11·3	10,840	6,780

Queensland pine is the standard plywood for all interior work to be stained, varnished, or painted. It is the best wood for corestock and centre plies in Australia, over nine-tenths of all the veneers cut being of Hoop Pine.

Queensland Pine plywood is very extensively used in the building industry for internal panellings, ceilings, door panels, and cabinets in houses, public buildings, and in shops and offices where it also finds service for counters, shelves, and partitions. In the furniture trade, stained and polished panels are used in medicine chests, wardrobes, dressing tables, bedsteads, and wardrobe doors and ends. It is also used almost exclusively for drawer bottoms, wardrobe mirror backs, and patterns.

Coachbuilders find the plywood of great service for linings, seats, and internal fittings of buses and trams. Boat builders use Hoop Pine for internal lining and panellings.

The Queensland dairy industry requires over 1,500,000 butter-boxes per annum, practically the whole of which are made of Hoop Pine and North Queensland Kauri Pine. The greater proportion of these are constructed in the form of wire-bound rotary-cut veneer boxes. Queensland Pine plywood also finds extensive use for a very large number of miscellaneous purposes, including camping kits, drawing boards, toys, and models, ping pong bats, radio cabinets, and waste-paper baskets.

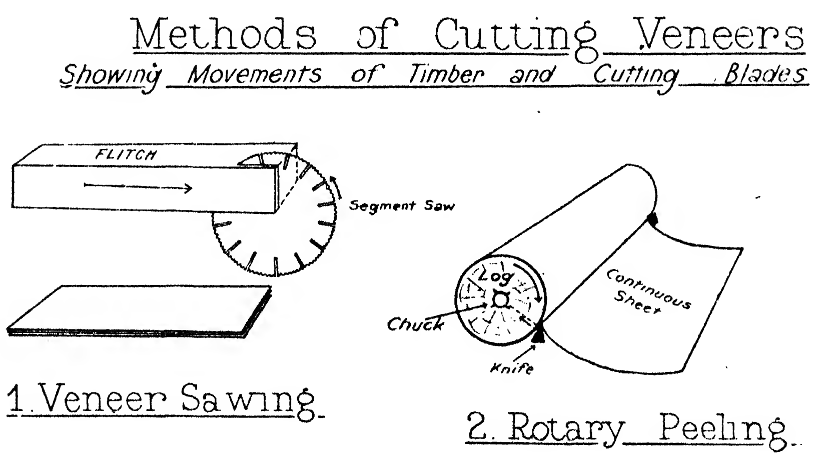

PLATE 67.

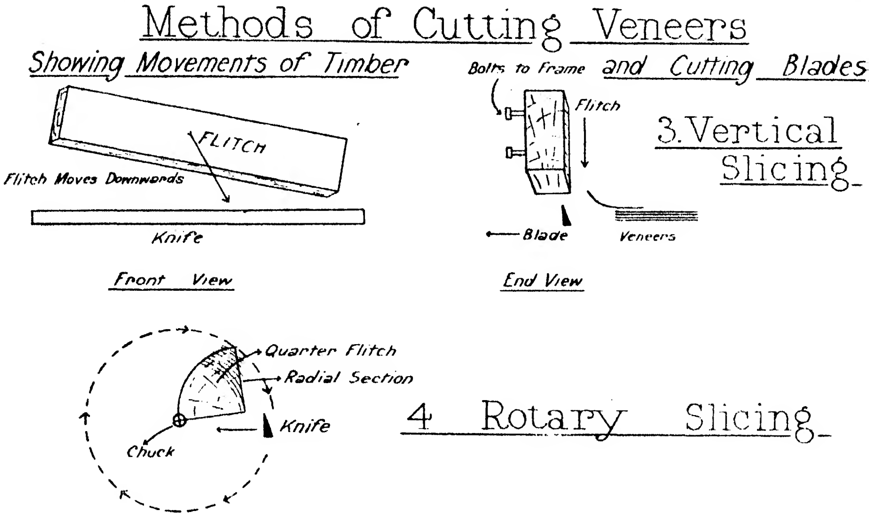

PLATE 68.

OTHER QUEENSLAND VENEER WOODS.

Amongst the Queensland timbers suitable for standard and fancy veneers and available in more or less limited quantities are the following:—

SILVER ASH (*Flindersia pubescens*).—A pleasing white, easily worked timber of the Maple Silkwood type in weight and texture and capable of being stained readily to any shade required. This wood makes a very high-grade plywood, and has at times a very pleasing figure. Rotary peeling gives the best effects. Logs are available from North Queensland.

SATIN SYCAMORE (*Ceratopetalum virchowii*) is similar in texture and working qualities to the Coachwood (*Ceratopetalum apetalum*) of New South Wales, but has a much more attractive figure. Rotary-cut veneer is well suited for interior decorative panelling. This wood grows only in the Atherton district in North Queensland.

ROSE ALDER (*Ackama quadrivalvis*).—This is a similar type to Satin Sycamore and grows in the same areas. It is, however, normally unfigured and presents a uniform bright-pink colour. It makes good rotary plywood.

ROSE WALNUT (*Cryptocarya erythroxylon*) is a native of Southern Queensland scrubs, and is available in large logs in moderate quantities. The plywood is pale-pink in colour with pleasing variations in shading. It is very strong and durable, and makes attractive wall panelling.

BLACK BEAN (*Castanospermum australe*) is sometimes veneered for overlaying furniture and for special panels. It cuts cleanly, and is often available in highly-figured wood, but the irregular shape of the trees makes the average returns of veneer rather low. The best logs are obtained in the Atherton district. The solid wood is often used for carving because of its mellow nature.

PLATE 69.—LOGS AWAITING PEELING AT A COUNTRY PLYWOOD FACTORY.

Plate 70.—Rotary Lathe in Operation.

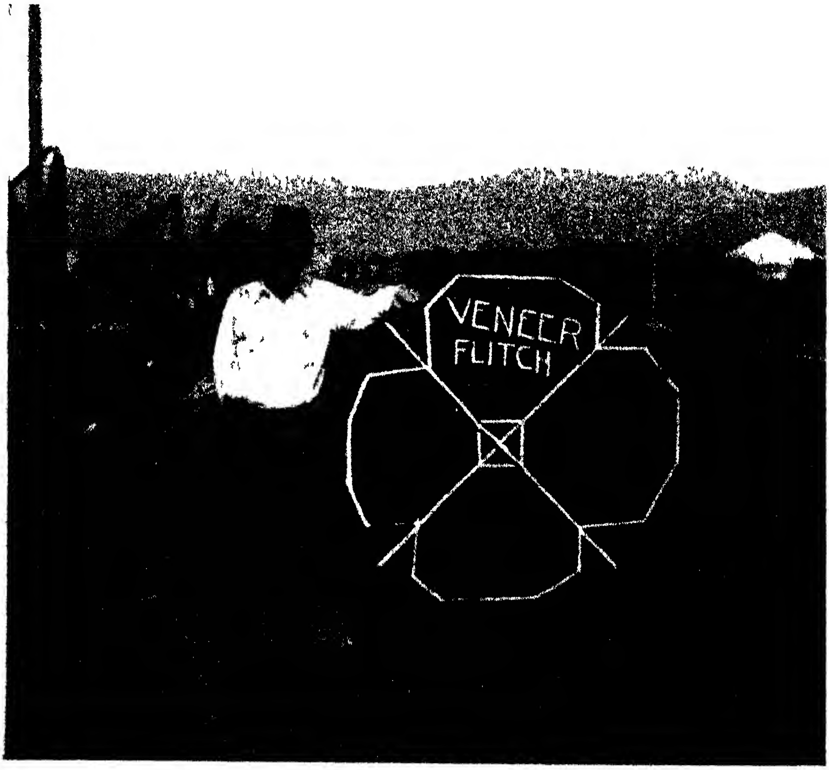

Plate 71.—Queensland Walnut Log Marked for Sawing into Flitches for Quarter-slicing.

NAMES OF QUEENSLAND VENEER WOODS.

Official Name.	Botanical Name.	Other Vernaculars.
Black Bean	*Castanospermum australe*	Beantree
Bunya Pine	*Araucaria bidwillii*	..
Canary Sassafras	*Doryphora sassafras*	Sassafras
Candlenut Siris	*Aleurites moluccana*	Candlenut
Hoop Pine	*Araucaria cunninghamii*	..
Ivorywood	*Siphonodon australe*	..
Kauri Pine	*Agathis palmerstoni*	..
Maple Silkwood	*Flindersia brayleyana*	Maple, Red Beech
	Flindersia pimenteliana	Silkwood
Queensland Satinay	*Syncarpia hillii*	..
Queensland Walnut	*Endiandra palmerstoni*	Walnut Bean, Black Walnut, Oriental Wood, Australian Laurel
Red Cedar	*Cedrela australis*	Cedar
Red Silkwood	*Lucuma galactoxyla*	Cairns Pencil Cedar
Red Siris	*Albizzia toona*	Acacia Cedar
Red Tulip Oak	*Tarrietia argyrodendron* var. *peralata*	Red Crowsfoot Elm
Rose Alder	*Ackama quadrivalvis*	Feathertop, Pencil Cedar
Rose Walnut	*Cryptocarya erythroxylon*	Pigeonberry Ash
Satin Sycamore	*Ceratopetalum virchowii*	Blood-in-the-bark
Silky Oak	*Cardwellia sublimis*	Bull Oak
Silver Ash	*Flindersia pubescens*	Ash
	Flindersia schottiana	Bumpy Ash
Silver Quandong	*Elæocarpus grandis*	Quandong
Tulip Cedar	*Melia azedarach*	White Cedar
Tulip Plum	*Pleiogynium solandri*	Burdekin Plum
White Aspen	*Pleiococca wilcoxiana*	Snowwood
White Hazelwood	*Symplocos spicata*	..
Yellow Cheesewood	*Sarcocephalus cordatus*	Leichhardt Tree
Yellowwood Ash	*Flindersia oxleyana*	.

ARE SOWS BETTER BACONERS THAN BARROWS?

A question that often crops up in the judging of pork and bacon pigs at agricultural shows is as to whether the sow will make up into better bacon than a barrow. The answer to such a question takes into consideration two phases. Sow pigs, particularly in warm climates, come in season very early, and one often notices sows awaiting slaughter that show distinct evidence of the oestral period (or of being on heat or in season). If slaughtered while in the feverish condition that accompanies the oestral period the meat will not set well nor will it be as good as is desirable in the finished form.

On the other hand, sow pigs produce a larger proportion of first grade bacon, lean meat, than barrows, for sows are lighter in back fat and are thicker in the streak of lean meat running along the sides than is the case with males; on the other hand, there is less risk with barrow pigs, although it must be remembered that improper castration often results in the formation of deep-seated abscesses in the area of the scrotal sac, and many a good pen of barrow baconers has suffered at the hands of the judge who is discriminating and takes special care to examine that portion of the body referred to before giving his decision. Perhaps, after all, sow pigs do make the best bacon, but on the average so much depends on breeding, type, feeding, and handling that the matter of sex is virtually an unimportant one, and further the farmer has no control over the sex of his pigs so must make the best use possible of both boars and sows.

THE DAIRY INDUSTRY.

Supplied by the DAIRY BRANCH.

BREEDING.

Need for Better Cows.

The industry needs better cows, and the dairy farmers and breeders must breed and rear the better cows because they do not exist to the extent required at present. A great deal has been written on breeding. Practical breeders and scientific minds in collaboration have prepared sufficient data to enable the application of general principles to breeding, which if adopted by dairy farmers will lead to considerable improvement in their herd yields.

Mendel and His Theory.

The first to conclusively draw attention to the fact that there was a definite law of averages operating in respect to the transmission of characteristics from parents to progeny was Gregor Mendel. He was born in the year 1822, and was admitted to the King's Cloister, at Brünn, to be trained as a teacher. He was ordained a priest in 1847, went to Vienna from 1851 to 1853 to study mathematics, physics, and the natural sciences. He returned to the King's Cloister, of which, in 1868, he became prelate. In the Cloister garden at Brunn Mendel became an experimental plantgrower, and turned his attention to hybrids and hybridisation to discover the law governing reproductive behaviour.

It had been previously noted from breeding experiments with hybrids that among their descendants the hybrid kinds decreased while the pure kinds increased, but, so far, nobody had made a systematic classification and count of the whole of any hybrid's descendants through several generations. This Mendel set out to do and selected the ordinary edible pea as a suitable plant to use for the purpose.

Occurrence of Hybrids.

The result of Mendel's experiments was to show that hybrids do not breed erratically, as had been believed hitherto, but with extraordinary regularity. Since the finding of Mendel's papers in 1900 a considerable amount of scientific investigation has been made into what was known as the "Mendelian Theory," all of which has confirmed the extraordinary law of average operating in regard to the inheritance of characteristics.

In a previous article brief reference was made to the transmission of characteristics from the sire and dam to the progeny, and the terms "dominant" and "recessive" were used to distinguish between factors or characters which were apparent and those which were hidden or had seemingly disappeared. In the case where neither factor is dominant, however, we have an admixture between the two factors.

Law of Inheritance.

The following illustration of colour inheritance will indicate clearly the law which operates. Red crossed with red produces all red. White crossed with white produces all white. Red crossed with white produces all roan.

It will be observed that red and white are the true breeding colours and that roan is an admixture or cross of the red and white. Roan is therefore a hybrid, and when crossed with another roan should produce on the Mendelian average one pure red and one pure white to every two roans.

Roan crossed with red produces equal numbers of roans and reds, while the roan and white cross produces equal numbers of roans and whites.

The Sex Problem.

It will be evident to all that throughout the animal kingdom the most common character difference is that of sex. Careful research has shown that in many animals the male forms two types of germ-cells—namely, a male-determining cell and female-determining cell, which are formed in equal numbers. All animals do not follow this rule, however. In fowls, for instance, the position is reversed.

The calf is developed by the union of a male cell with a female cell, both of which contain the characteristics of the parents. Thus each joint cell, or the embryo calf, contains two sets of characteristics, one from each parent.

It will be evident from the foregoing that either of the individual factors in these sets of characteristics may be dominant while the other will be recessive, except where neither the male nor female factor is dominant, when the result will be an admixture of the two.

Inheritance from Sire and Dam.

Investigations have indicated that both parents contribute on the whole an equal number of characters to the offspring. It may happen, however, that the factors transmitted by the sire are dominant, and thus give the appearance of a greater inheritance from the sire. This actually does happen in the case of pure-bred bulls, which generally possess more dominant factors than the cows to which they are frequently mated.

Inbreeding, Line-breeding, and Outbreeding.

Modern investigations shed much light on the significance of these breeding practices, and indicate their value in breed improvement work, and at the same time their limitations.

Inbreeding.

In its broadest sense this term implies breeding between related individuals. As there are degrees of relationship, so there are degrees of inbreeding. If the animals are very closely related it constitutes intensive inbreeding, but if the animals are more distantly related the practice may be regarded as line-breeding.

The experience of all leading breeders shows that a considerable measure of inbreeding is necessary if uniformity in type or characteristics is to be attained. This is no new discovery, but was recognised by one of the earliest breeders—Robert Bakewell, who was born in Leicestershire in 1726 and died there in 1795.

Bakewell's Method.

The name of Robert Bakewell is famous, and reference is made to him in nearly all works on breeding. It is interesting to note his procedure in breeding. His chief successes were with cattle to produce beef and sheep to produce mutton.

About 1760, after travelling up and down the country to discover which were the best cattle to produce beef, he added to the stock already on his farm a bull from Westmoreland and several heifers from Warwickshire. The ordinary breeder would have sent this bull away when his eldest daughters were rising three and he was four or five years old, but because he could find no other bull to take his place Bakewell kept this bull till he was at least seven or eight years old and one of his sons was found fit to take his place. This son was also retained till one of his sons again was found fit to take his place.

This practice of selecting successive sires from his own stock was continued by Bakewell throughout his lifetime. A sire which left stock carrying the characters Bakewell desired them to carry was kept alive till a son was found which bred equally well or better. One of his sires was at least twelve or thirteen years old before being sent away. This meant that Bakewell's stock were very closely inbred.

Bakewell's method is perhaps more clearly indicated by his practice with sheep. When his flock, which, like his herd, started with the introduction of sheep from elsewhere, was established, other breeders wished to buy sires from him, but Bakewell would not sell sires; he would only let. Thus though the lambs they produced belonged to other breeders the sires still belonged to Bakewell, and those that bred the kind of stock Bakewell desired could be brought home again.

How many of our dairymen and breeders have wished that they could bring home again some sire whose worth was proved only after they had disposed of him? There is a lesson to be learnt in this story of Bakewell's practice.

Merits and Demerits of Inbreeding.

Many of the most noteworthy animals in the history of breeding have been the result of very close inbreeding, and this fact in itself should be sufficient to show that there is considerable merit in the practice. It has long been recognised that high-class inbred animals are prepotent. Unfortunately, closely inbred matings are just as likely to accentuate defects.

This tendency is, of course, very frequently seen in the human race, when certain heritable defects, such as feeble-mindedness, if present in a family, tend to show up following marriage within that family.

The question then arises: Is inbreeding harmful in itself? There is abundance of scientific evidence to show that it is not necessarily harmful, and, moreover, there is also plenty of practical evidence from our leading breeders. Experiments have been carried out in which rats have been bred under a system of brother to sister matings for twenty five generations, and though in some strains there was deterioration, yet in certain selected ones no reduction in vigour, size, or fertility resulted.

The evidence shows that inbreeding tends to promote uniformity in characteristics. However, without rigid selection it will, as previously mentioned, accentuate harmful factors.

The stock that maintains its desirable characters under a system of inbreeding can be considered to have gained in value, for it would in consequence breed uniformly.

However, it must be stated that intensive inbreeding is a tool which should only be used in the hands of the big, skilled breeder who is prepared to cull drastically. The small breeder cannot afford to do much culling, and consequently should not be encouraged to conduct intensive inbreeding.

Line-breeding.

Line breeding is a moderate form of inbreeding. It promotes a concentration of factors from related parents and thus tends to uniformity, though not necessarily to the same extent as inbreeding. It has the advantage of limiting also the accentuation of defects, and gives a considerable measure of control over heredity. It is a wise policy to follow in breeding, and it might be definitely said that, except where a strain does not possess the desirable breed characteristics, it is the only system which should be encouraged.

The following table is an example of line breeding:—

LINE BREEDING.

- *A* therefore contains 25 per cent. of *I*'s blood.
  - *B* = ¼ of *I*
    - *D* = ½ of *I*
      - *I*
    - *E*
  - *C* = ¼ of *I*
    - *F* = ¼ of *I*
      - *H* = ½ of *I*
        - *I*
      - *J*
    - *G* = ¼ of *I*
      - *K* = ¼ of *I*
        - *M* = ½ of *I*
          - *I*
      - *L* = ¼ of *I*
        - *N* = ½ of *I*
          - *I*

All animals shown in the pedigree except E and J carry a definite infusion of the blood of I. By this method desired individual characteristics of animals can be retained or even intensified in the progeny.

Outbreeding.

Outbreeding or outcrossing indicates a system of mating between animals of different strains or blood lines. Under such a system the variation in heritable factors must produce variation in the progeny. An outcross is only justified when it is desired to introduce some new combination of characters. Even then this should be followed by a renewed system of line-breeding, preferably to the blood of the favoured strain, and in this way the undesirable qualities of the original strain would be gradually eliminated.

Outbreeding often results in the production of very superior individuals. The progeny inherit the desirable dominant factors in both strains, but, being hybrids, their progeny breeds in the manner outlined in Mendel's experiments, and therefore as breeding animals they do not live up to their appearances.

Conclusion.

The subject of breeding is an extensive one. A prerequisite to the study of Mendelism is a good knowledge of mathematics. This article is therefore merely an elementary discourse on these subjects designed to interest dairy farmers in the laws which govern the inheritance of characteristics and by encouraging the adaptation of theory to practice lead to an improvement in breeding practices generally.

AGE AS A FACTOR IN BREEDING SOWS.

By E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

The question is frequently asked, "How long will a breeding sow continue in profit; or, at what age should a boar be culled out? At what age is a sow at her best; and is a six year old boar too far down the hill to be productive?" These questions are not readily answered, because so many factors have to be taken into consideration. First and foremost, pigs are kept solely because they are profit makers, and once they reach the stage where they are unprofitable they should be rigorously culled irrespective of all their other qualities.

Secondly, they are not of sufficient value individually to warrant consideration unless they can produce at a maximum profit. No animals should be kept on the farm merely for the sake of keeping them, and at best it is almost cruel to pension an animal off unless funds are available to enable that animal to be properly fed and cared for.

Experience has shown that the best age at which to commence a sow on her stud duties is between eight, or ten, or twelve months old. Sows are invariably ready to mate at ten months of age, some of the larger breeds are big enough at eight months, but should not be mated too young, as the breeding organs do not develop as rapidly as the framework. The boar is invariably ready to work at ten months, and in his case, too, he should not be used too young. The length of life at which they remain profitable varies considerably. Some sows and boars are in their prime at five years of age, others have ceased to be profitable at that age. However, if properly cared for and maintained in reasonable breeding condition, there is no reason why both boar and sow should not be good breeders up to the age of eight years, although in general very few breeders reach that age.

Overseas experiments have demonstrated that the best breeders are those that are properly developed before their stud duties begin. Sows are better breeders if they are continuous breeders—that is, if they have two litters per annum regularly and are not allowed to lose time between litters. The boar is a better and more reliable sire if he is regularly in service and is maintained in breeding condition only. Over-fatness, lack of exercise and unbalanced rations are both detrimental to the productive capacity of breeding stock. Sluggishness is induced and sterility or barrenness encouraged more by over-feeding and by a lazy life than by regularity of feeding and stud duties. The boar is capable of mating with fifty sows per annum; the sow is capable of producing twenty young pigs each year, and it should be the objective of the pig-raiser to obtain maximum results, and even if he is not able to provide sufficient work for the boar, he certainly can maintain his sows at full profit, and when they reach the stage that they are on the down grade, both male and female should be culled to make way for younger and more productive animals.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Jersey Cattle Society, the Australian Illawarra Shorthorn Society, and the Friesian Cattle Club, production charts for which were compiled for the month of December, 1933 (273 days period unless otherwise stated):—

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	JERSEY.			
	MATURE COW (OVER 5 YEARS), STANDARD 350 LB.			
Norwood of Fernlea	Kittle Brothers, Gleneagle	7,182 38	434·09	Oxford Palatine Butter Boy
	SENIOR, 2 YEARS (OVER 2½ YEARS). STANDARD, 250 LB.			
Oxford Carnation	E. Burton and Sons, Wanora	5,212·38	314·236	Oxford Silvius
Oxford Clara	P. A. Smith, Miriam Vale	5,582	282·941	Trinity Ambassador.
Greenstock Buttercup (365 days)	J. B. Keys, Gowrie Little Plains	8,650·79	505·733	Carnation Larks Baron
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD, 230 LB.			
Glenview Cowslip	F. P. Fowler and Sons, Coalstoun Lakes	4,782	304·722	Carlyle Larkspur 2nd Empire
Gunawah Opera Queen (251 days)	F. Maurer, Darra	5,558·28	301·809	Retford Prometheus
Golden Daffodil of Golden Hill	C. Klaus, Mundubbera	4,779	262·41	Hero of Golden Hill
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD, 290 LB.			
Alsia of Glengallon	R Tweed Kandanga	8,168·8	329·478	Nobleman of Blacklands.
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD, 230 LB.			
Murrays Bridge Phyllis 3rd	Hemmings Brothers, Murrays Bridge	6,522·5	277·878	Valiant of Greyleigh
Murrays Bridge Ivy 2nd	Hemmings Brothers, Murrays Bridge	6.204	266 292	Valiant of Greyleigh
	FRIESIAN.			
	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD, 250 LB			
Oaklands Nolly Rock (365 days)	W. Richters, Tingoora	13,781·26	519 601	Pied Rock

Answers to Correspondents.

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. Cyril T. White, F.L.S.

Prickly Poppy.

S.C. (Allora)—

The specimen is *Argemone mexicana,* the Prickly Poppy, also known as Mexican Poppy. The plant is gazetted as a noxious pest throughout the State. It has been established in Queensland for a number of years, and is reputed to be poisonous to stock. However, stock generally leave it entirely alone. The only cases of poisoning by it that have come under our notice have been where the plants have been cut, allowed to wilt, and the wilted and softened plants eaten by calves.

Christmas Bells.

INQUIRER (Brisbane)—

The Christmas Bells are plants of the Lily family and belong to a genus called *Blandfordia,* which is confined to Australia, not being found in any other part of the world. Four species or different kinds are known. Three of these are found in the coastal swamps of the so called "wallum" country of New South Wales and Queensland. The common species in Queensland is one of the largest of the genus, and is found in New South Wales as far south as Sydney. The fourth species occurs in Tasmania, ascending some of the mountains to a height of 4,000 feet.

The genus *Blandfordia* was named by Sir J. E. Smith, a famous English botanist, and first president of the Linnean Society of London, in compliment to George, Marquis of Blandford, and son of the second Duke of Marlborough.

The Australian *Blandfordias* were introduced into cultivation in England in the early part of the 19th century, and in an Encyclopædia of Plants, published by J. C. Loudon in 1829, they are described as "beautiful New Holland Liliaceous plants very rarely seen in English collections."

Bleeding Heart.

L.W. (Cairns)—

The specimen is *Homalanthus populifolius,* sometimes called Bleeding Heart owing to the fact that the leaves turn red with age. It has a wide distribution in Eastern Australia, from the Bulli district in New South Wales to the Atherton Tableland. It is sometimes called the Bulli Poison Bush, but stockowners on the Atherton Tableland have told us that they have fed the plant to stock during times of drought and found it to be quite a good fodder. It belongs to the family Euphorbiaceæ.

Wild Millet.

W.G.A. (Rockton)—

The specimen is *Echinochloa crus galli,* commonly known as Wild Millet. It is a grass widely spread over the warmer regions of the world, and very variable in form and size. One form is a more or less common weed in cultivations in Queensland, particularly on the Darling Downs, and this seems to be the one you forward, but it is an annual grass and is quite a good fodder, being relished by all classes of stock. It is supposed to be one of the wild parents of such well known cultivated fodders as Japanese Millet and White Panicum.

Prickly Lettuce.

A.S. (Mount Larcom)—

The specimen is the Prickly Lettuce, *Lactuca scariola.* This plant is generally regarded as poisonous to stock, though it would only seem to be in exceptional circumstances that they eat it in sufficient quantity to cause trouble. Generally speaking, it is left untouched by them. The poisonous symptoms are said to be intoxication similar to that caused by poppy heads, narcotic effects being dominant.

Native Tobacco.

A.M.McL. (Springsure)—

Regarding your inquiry about *Nicotiana megalosiphon*, the Long-Flowered Native Tobacco, no feeding tests or chemical work have been carried out wtih this species. Dr. J. M. Petrie, working on what he termed *Nicotiana suaveolens*, found the plant to contain a large percentage of nicotine, and nicotine is among the most violent poisons known. Dr. Petrie estimated that there was enough nicotine contained in ½ lb. of the green plant to poison a sheep, but feeding tests carried out afterwards in New South Wales did not bear this out, though other feeding tests did.

Up till recent years all the Australian Nicotianas were known as *Nicotiana suaveolens*, the different forms being classed merely as varieties. These have mostly been raised to specific rank now. It is probable that their nicotine content varies. It probably varies also from district to district. All Nicotianas must be regarded as dangerous, and they are certainly not safe plants to have where children are running. If children did chew the plants I think they would be taken violently ill or death would ensue. Both leaves and flowers of other Solanaceous plants have been known to kill children, such plants, for instance, as Cork Wood, *Duboisia myoporoides*, and the Stramonium, *Datura stramonium*.

Maltese Cockspur.

T.A.C. (Chinchilla)—

The specimen is the Maltese Cockspur, *Centaurea melitensis*. This is an objectionable weed in the southern and the cooler parts of the State. If it has appeared on your property on an extensive scale you could try eradicating it by a chemical spray such as "Weedex." If only a few plants have established themselves they could be eradicated by hoeing out. In all cases it is preferable to deal with weeds of this type before they flower.

Broad-leaved Carpet Grass.

D.H. (Kuraby)—

The sample has been identified as the Broad leaved Carpet Grass, *Axonopus compressus*. This grass has some value as a fodder on light soils or on second grade country where the better pasture grasses will not flourish.

Bishop's Weed.

S.C. (Warwick)—

The specimen is *Ammi majus*, Bishop's Weed, a common European plant, grown a good deal in Australia under the name of Meadow Sweet. It is used extensively in the cut flower trade, but is not to be confused with the true Meadow Sweet of Britain. It has become naturalised in several localities, but so far as I know has not yet shown any tendency to become a noxious plant. It is very difficult to foretell the behaviour of these plants when once they begin to spread, but I do not think any fears should be entertained regarding the present specimen.

Caustic Creeper.

A.J.I. (Hodgson)—

Euphorbia Drummondii, Caustic Creeper.—In New South Wales this plant has been found to contain a prussic acid-yielding glucoside, and when eaten in large quantities by travelling stock, particularly when hungry and on an empty stomach, a number of deaths may ensue. Repeated tests with the Queensland plant, however, have always given negative results, and the symptoms given certainly do not point to prussic acid poisoning. The symptoms are that the head and neck swell to a large extent, and if the swelling is pierced an amber coloured fluid runs out and the life of the sheep may be saved.

Capacity of Hayshed.

W.H.J. (Mount Larcom)—

A hayshed having dimensions 40 feet by 30 feet by 12 feet would hold approximately 32 tons of lucerne hay. A ton of lucerne hay would occupy approximately 450 cubic feet.

General Notes.

Staff Changes and Appointments.

Mr. J. W. Winlaw, Assistant Teacher of Manual Training Subjects, Rural School, Gayndah, has been appointed an Inspector under the Stock, Dairy, and Slaughtering Acts, Department of Agriculture and Stock.

Constable P. B. Guymer, Hungerford, has been appointed also an Inspector of Slaughter houses.

The Officer of the Northern Territory Police stationed at Lake Nash has been appointed also an Acting Inspector of Stock, Queensland.

Mr. H. Bellert, junior, Fraser Island, has been appointed an Honorary Ranger under the Native Plants Protection Act.

Mr. E. J. R. Barke, Chemist in Charge, Sugar Experiment Station, South Johnstone, has been appointed Chemist in Charge, Sugar Experiment Station, Meringa.

Mr. F. G. Few, B.Sc., B.App.Sc. (Queensland), Assistant to Analyst, Agricultural Chemical Laboratory, Department of Agriculture and Stock, has been appointed Analyst, Agricultural Chemical Laboratory.

Mr. E. T. Lewin, Inspector of Stock, Julia Creek, and Mr. S. C. Allan, Inspector of Stock, Cloncurry, have been appointed also Inspectors of Slaughter houses.

Animals and Birds Sanctuaries.

Whitsunday, Hook, and Gumbrell Islands have been declared sanctuaries for the protection of animals and birds by Order in Council issued 11th January, 1934. Other islands of the Group—namely, Hayman, the Double Cone, and Molle Groups—have already been declared sanctuaries under the Animals and Birds Acts.

Egg Board Election.

The election of a grower's representative for District No. 4 (Moreton) of the Egg Board resulted in the return of the retiring member, Mr. Alexander McLauchlan, Boonah, who received 117 votes as against 54 votes cast in favour of Mr. H. J. Jurgensen, Moogerah, via Kalbar. All of the other members of the Board—namely, Messrs. R. J. Corbett, A. A. Cousner, Tom Hallick, and W. T. Hughes—were returned unopposed. The new Board will be appointed for a term of one year as from the 1st January.

Honey Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts, giving notice of intention to extend the operations of the Honey Board from the 9th March, 1934, until the 8th March, 1939.

A petition signed by 10 per cent. of the growers of honey and beeswax may be lodged on or before the 5th February next requesting that a vote may be taken on the question of the continuance of the Pool until March, 1939.

Nominations are also being invited for the election of four representatives on the Honey Board for a period of two years as from 9th March, 1934.

Rural Topics.

When Washing the Milk Cans.

Boiling water is absolutely necessary in dairy work to ensure cleanliness, and there should be no sparing of it. It is well, however, not to start washing the utensils with water that is boiling, for this very high temperature has a tendency to cause the albumen to coagulate, and stick to the utensil in a thin, often invisible, film that supplies a breeding ground for bacteria. The utensils should first be washed with warm water, with a little washing soda or other alkali added, using good brushware (cloths being very objectionable), after which they should be scalded in ample boiling water, and then placed in a clean place to dry.

Green Feed for Poultry—Precautions against Poisoning.

The poisonous properties of many weeds, and even of some fodder plants at certain stages (or if eaten in excess), is well known among big stock owners, but it is not generally recognised to what extent poultry become victims to unsuitable and even poisonous green stuff.

Many thousands of poultry are lost and many more are made ill (with a consequent los of egg-production) as a result of eating weeds of various kinds. This is nearly always brought about by circumstances and environment. For instance, a shortage of suitable green feed will cause the birds to eat many weeds that they would not otherwise touch. This particularly applies to birds kept in bare yards or confined to houses. If let out such birds will eat almost anything green. Naturally they will eat suitable fodders if available, but if not they will often eat unsuitable ones.

Obviously, too, if such birds are let out of bare yards on to a perfectly good class of green food they will eat to excess, and trouble in the form of digestive disorder will often ensue. How much more serious then may the trouble become if there are present one or more injurious plants instead of good edible fodder plants or grass. Birds roaming on free range will rarely eat poisonous weeds or any fodder in excess.

Another way in which poultry farmers encounter this trouble is in the green feed supplied to the pens. Take, for example, the farmer who is growing such crops as lucerne for green feed, cutting and feeding it to the birds in yards divested of any edible green feed whatever. Many cases came under notice where birds are dying or are falling off in production, where the cause is found to be some weed or unsuitable green feed that is being unsuspectingly fed with the other fodder, the farmer being under the impression that the birds will pick out only the suitable stuff. As a matter of fact, that is what would occur if there was sufficient of the good fodder, but in most such cases there is not, and hence the trouble.

Another source of trouble in connection with growing green feed for poultry is that it is often cut and fed at a stage when it has become too fibrous, and even contains some dead matter, such as dead flag of barley, &c. The trouble in this connection arises not so much from the excessive fibre content, but from the fact that such dead matter often forms itself into balls and prevents the passage of the other food from the crop to the gizzard, the only portion of the anatomy of the bird that can deal with it. The result of this stoppage is what is known as "sour crop," a condition that arises from fermentation of the food that is held back long after it should have passed on to the gizzard.

It will be seen how necessary it is for the poultry farmer to be ever on the alert to prevent these happenings, remembering always that if birds are kept short of their requirements in the way of succulent green feed, they are likely to eat too much when let out on to pasture of any kind. In cases where birds have been so kept, and it is desired to let them out of bare yards on to a growth of vegetation of any kind (even grass, if succulent) it is best to let them on to it for only half an hour to an hour at a time, gradually lengthening the period each day for a few days before allowing full access to the new run.—A. and P. Notes, N.S.W. Dept. Agric.

Molasses for Pigs.

The College of Agriculture, University of the Philippines, has recently carried out experiments on thirty five pigs over a period of seven months to determine and compare the feeding value of molasses and corn as basal feed for growing pigs and sows for breeding purposes.

(1) In the mixture of feeds used in these experiments for growing pigs and young breeding sows, one part of molasses was equal to one part of corn in feeding value.

(2) Molasses can be substituted in part for corn when corn becomes scarce and expensive.

(3) To prepare an animal for show purposes molasses appears to be a very useful feed, as it imparts a smoothness and refinement to the general appearance of the animal, and has a beneficial effect on the digestive organs.

(4) Molasses is an appetiser, a conditioner, and a useful addition to feeding stuffs for pigs, but must not be fed in excess, or as a sole food, otherwise results will be unsatisfactory.

Fecundity Records in Pigs.

That fecundity is an hereditary factor in pig breeding is now generally recognised. The wise man buying a boar or a sow wants to know the farrowing records of the ancestors before he buys. When fecundity records were first introduced in Great Britain their usefulness and accuracy were not always accepted, but when the summaries of each year's records began to appear and pedigrees became something more than names, doubts disappeared.

Fecundity records and their development in the form of an advanced Register of Sows that have achieved a minimum standard of eight pigs reared in four consecutive litters within twenty-six months afford interesting evidence of the value of the collection and collation of records from the herds of breeders.

A typical illustration of the value of these records is noted on the pedigree and record of a well known boar in England. The fecundity record of this animal shows that he is one of a litter of 12 born, 12 reared, that his sire was also from a litter of 12 born, 12 reared, and that his dam was from a litter of 11, all of which were reared.

With a record such as this, backed up by individual excellence of the ancestors and the boar himself, one would be quite justified in looking for even better results in the progeny of such an animal.

Railing Pigs in Crates in Queensland.

When stud pig breeders are railing pigs in crates from one station to another, they should remember that in order to discourage the use of cumbersome crates which are too large for a railway guard to safely unload at roadside stations, provision has been made in the railway goods By-laws for the rate for a half wagon to apply when the weight of a crate containing more than one animal exceeds 2 cwt.

Where two animals are to be forwarded and the total weight of pigs and crate exceeds 2 cwt., it is cheaper and better to forward in two crates.

Pig crates should be of a size to comfortably accommodate the animal, not too large or too small, and they should be made of soft wood and not of heavy iron-bark boards. Details of crate measurements and other information pertaining thereto can always be obtained from the Department of Agriculture and Stock, Brisbane.

Lucerne as a Food for Pigs.

As a result of experiments in the use of lucerne as a food for pigs and to determine its effect on the quality of bacon and ham, Mr. G. E. J. Chaseling, of Coolabunia, Queensland, advises caution against fattening pigs on lucerne or allowing them to run on lucerne while they are being finished for market. Lucerne, he considers, is most excellent grazing for growing pigs, but they should be kept off it for at least six weeks before going to market. He refers to the "feedy flavour" given to milk by lucerne, and states it gives the same undesirable odour to pork, and lucerne fed bacon takes on an ugly rusty appearance after being cured, which is most undesirable.

A Fair Question.

"What would a dairyman do to an orchardist who owned a diseased bull and allowed it to roam the district, or to the orchardist who sold milk and butter without being registered?" Mr. K. D. McGillivray, of Moorland, put this poser to delegates to the recent North Coast Agricultural Bureau Conference at Taree (N.S.W.), and answering the query himself he said that the law amply protected dairymen against such inconsiderate orchardists. "But what can the orchardist do to a dairy farmer whose neglected fruit trees are breeding and spreading pests and diseases, or to the dairy farmer who is unloading his surplus fruit on to a local market regardless of what price he gets for it?" continued Mr. McGillivray.

The law did not give orchardists as much protection as it gave dairymen, at least insofar as protecting them from unfair competition by those not legitimately engaged in the fruitgrowing industry. Mr. McGillivray considered that this state of affairs was due to the fruitgrowers not being as well organised as the dairy farmers. The orchardist did not want to deprive the farmer of the right to sell his surplus fruit, but he did think that farmers should not jeopardise the livelihood of commercial orchardists by allowing their neglected trees to become veritable breeding grounds for pests and diseases. Furthermore, he suggested that rather than sell their surplus fruit at any old price, they should ask a fair market value, the idea being not to depress prices, to the detriment of the commercial fruitgrower.

Cauliflower Cultivation.

Care in seed-bed work—more than is generally exercised—is essential if the growing of cauliflower (seed of which is usually sown from December to the early autumn months) is to give satisfactory returns.

It is very common to find growers using the same soil year after year for seed-beds because it is situated close to the water-tap. It has been proved that this procedure is responsible for the rapid spread of many of the most serious diseases. Again, insufficient attention is given to the preparation of the soil in the beds. To obtain the best results the beds should be prepared some weeks before sowing and given a liberal dressing of organic manure, which should be dug in and allowed to decay. A good practice is to give the bed a dressing of lime a few weeks before the soil is finally finished off for seeding. If artificial fertilizer is to be used in the seed beds it should be in the form of superphosphate alone.

The seed should be planted in rows, at least 4 inches apart, made across the beds. This practice allows the seedlings sufficient room for development and also facilitates weeding. The seedlings are ready for transplanting to the field about two months after seeding.

Animal Health Station—A Grazier's Tribute.

Thus "An Old Timer" in a letter to the Editor of the "Courier-Mail" (29th December, 1933):—That article which you published in the "Courier-Mail" on Thursday about the work of the Animal Health Station at Yeerongpilly brought forcibly to my mind the splendid work that has been achieved in the last thirty years. My earliest memory of Queensland goes back to a most unfortunate incident of many years ago. My father made a "fine deal" for some Queensland bullocks. I can remember the day they arrived; great shaggy, long horned, wild-eyed animals that appeared to be shivering with the cold blast that blew across the plains near Goulburn, in New South Wales. Within a week most of them were "down" with pleuro-pneumonia, and the disease took a terrible toll of them and of the rest of our cattle. At that time cattle were subjected also to anthrax, black-leg, and other deadly diseases. Years later, then in North Queensland, I had an experience—and a sad one, too—from redwater, a disease that brought ruination to many pastoralists. Nowadays we seldom hear anything of serious diseases in cattle.

I lift my hat, figuratively, to the veterinary surgeons who have captured and banished many of the dreadful stock diseases against which earlier breeders had to fight. Science has made wonderful strides in fighting the battle for the man on the land; it may have a long way still to go, and there might be a very vast field for it to clear up, but those whose memories can go back to the 'nineties and early nineteen hundreds will agree that a wonderful lot has been accomplished. Here's the best to the Animal Health Station at Yeerongpilly and all connected with it.

Big Cows or Little Cows?

Experiments conducted in America show that, so far as any definite statement can be made on the subject, the big dairy cow is more profitable than her smaller sister.

As a rule, large cows are better than the small ones for the production of milk and butter-fat. They also produce a higher income over food cost, in spite of the fact that they consume more roughage. The reason is that the larger animals require less food for maintenance per hundred pounds live weight. The energy expended in maintaining a living body can be measured in the heat radiated from that body. Radiation is in proportion to surface. The smaller animal has the greater surface in proportion to its weight, and consequently there is a greater radiation of heat from its body, and a greater consumption of food to supply energy.

Another reason why, for dairy purposes, a large animal is better than a small one is that the greater body space affords more room for the complicated "machinery" that is necessary to manufacture milk from food. Too often it is forgotten that milk is only made from food consumed. The amount of work performed by the heart and lungs of a heavy milking cow is enormous, so that any contraction in the region of the chest or any failure to pump an adequate blood supply through and around the udder, militates against big production.

In discussing the relative merits of the large and the small cow, the dual-purpose cow often confuses the issue. If an undue proportion of the food consumed is used for the manufacture of beef, the quantity available for milk production is proportionately reduced.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of unnecessary deaths.

HEALTH TALKS.

EVERY year about 6,000 children hear health talks given by the nurses of the Infant Welfare Railway Car. Sometimes they are asked to write little essays to show what they have learnt from these talks. Lately we have been shown some of these essays, which have pleased us so much that we are printing two of them. We have left out some sentences, but have made no alterations. We should like to explain that we do not ask children to drink no tea until they are twenty one. We think that children under school age should drink no tea at all. They can be quite happy with milk and lemon drinks. If older children drink tea, it should be half milk. We hope that long before they are twenty one they will have learnt to like tea that is not too strong and has plenty of milk in it.

The first essay is by a little girl of eight years. "There are three things we need to live—fresh air, fresh water, and food. We should sleep on a veranda or in a room with the doors and windows wide open. The best time to have a drink is to have it when we get out of bed in the morning, and we should have a bath then, too. We must eat foods that contain vitamins, such as all green vegetables, tomatoes, milk, eggs, nuts, cod liver oil, wholemeal, carrots, and fresh fruits. Arrowroot biscuits and soft, sweet, sticky toffee should not be eaten because they stick round the teeth, and a toothbrush will not get all out and so it decays the teeth. Children should not drink tea before they are twenty one because it dries up the saliva in their mouths and then they have nothing to help them digest their food. And they do not need it because it is a drug and a stimulant."

The second essay is by a girl of twelve years. "The most essential way to keep healthy is to see that we have sufficient fresh air. We should sleep on the veranda if possible, and, if not, in a room which has the doors and windows wide open. The next essential to health is fresh water. We should drink plenty of water on rising in the morning. Plenty of fresh water should be used in having a daily bath. Also, there are the right kinds of foods. Every child should drink fresh cow's milk and eat wholemeal bread, green vegetables, tomatoes, butter, cheese, and eggs. By wholemeal bread is meant bread made with pure wholemeal flour, not bread darkened with syrup. Every mother should buy wholemeal flour for her children, as it can be used for making bread, scones, pastry, &c. Milk should be drunk at all meals, and water between meals. If mother gives us fruit for lunch we should eat it last, as it cleans our teeth and we cannot carry our toothbrushes to school. A sign with "Bad teeth sold here" should be pasted across all confectioners' shops so that children will realise what they are buying. Boiled lollies and barley sugar are the only sweets to be eaten by children."

Though we may not agree with every word, we think these essays prove that children are interested in health talks, remember what they hear, and can write it down afterwards. Education is a preparation for life, and good health is one of the most important things in life. Is it not strange that children are taught so little about health while at school? These children hear a lecture on health only once a year, but the children in Brisbane and other towns never hear any such lecture at all. Can they be really educated when they have not learnt the simplest rules for keeping in good health? We hope all school teachers and education authorities will put on their thinking caps and consider what can be done about this.

Orchard Notes for March.

THE COASTAL DISTRICTS.

IF the weather is favourable, all orchards, plantations, and vineyards should be cleaned up, and the ground brought into a good state of tilth so as to enable it to retain the necesary moisture for the proper development of trees or plants. As the wet season is frequently followed by dry autumn weather, this attention is important.

Banana plantations must be kept free from weeds, and suckering must be rigorously carried out, as there is no greater cause of injury to a banana plantation than neglect to cultivate. Good strong suckers will give good bunches of good fruit, whereas a lot of weedy overcrowded suckers will only give small bunches of undersized fruit that is hard to dispose of, even at a low price.

Cooler weather may tend to improve the carrying qualities of the fruit, but care must still be taken to see that it is not allowed to become over-developed before it is packed, otherwise it may arrive at its destination in an over-ripe and consequently unsaleable condition. The greatest care should be taken in grading and packing fruit. Only one size of fruit of even quality must be packed. Smaller or inferior fruit must never be packed with good large fruit, but must always be packed separately as required by regulation.

The marketing of the main crop of pineapples, both for canning and the fresh fruit trade, will be completed in the course of the month, and as soon as the fruit is disposed of plantations, which are apt to become somewhat dirty during the gathering of the crop, must be cleaned up. All weeds must be destroyed, and if blady grass has got hold anywhere it must be eradicated, even though a number of pineapple plants have to be sacrificed, for once a plantation becomes infested with this weed it takes possesion and soon kills the crop. In addition to destroying all weed growth, the land should be well worked and brought into a state of thorough tilth.

In the Central and Northern districts, early varieties of the main crop of citrus fruits will ripen towards the end of the month. They will not be fully coloured, but they can be marketed as soon as they have developed sufficient sugar to be palatable; they should not be gathered whilst still sour and green. Citrus fruits of all kinds require the most careful handling, as a bruised fruit is a spoilt fruit, and is very liable to speck or rot. The fungus that causes specking cannot injure any fruit unless the skin is first injured. Fruit with perfect skin will eventually shrivel, but will not speck. Specking or blue mould can therefore be guarded against by the exercise of great care in handling and packing. At the same time, some fruit is always liable to become injured, either by mechanical means, such as thorn pricks, wind action, hail, punctures by sucking insects, fruit flies, the spotted peach moth, or gnawing insects injuring the skin. Any one of these injuries makes it easy for the spores of the fungus to enter the fruit and germinate. All such fruit must therefore be gathered and destroyed, and so minimise the risk of infection. When specked fruit is allowed to lie about in the orchard or to hang on the trees, or when it is left in the packing sheds, it is a constant source of danger, as millions of spores are produced by it. These spores are carried by the wind in every direction, and are ready to establish themselves whenever they come in contact with any fruit into which they can penetrate. Specking is accountable for a large percentage of loss frequently experienced in sending citrus fruits to the Southern States, especially early in the season, and as it can be largely prevented by the exercise of necessary care and attention, growers are urged not to neglect these important measures.

Fruit must be carefully graded for size and colour, and only one size of fruit of one quality should be packed in one case. The flat bushel-case (long packer) commonly used for citrus fruits does not lend itself to up-to-date methods of grading and packing, and we have yet to find a better case than the American orange case. Failing this case, a bushel-case suggested by the New South Wales Department of Agriculture is the most suitable for citrus fruits, and were it adopted it would be a simple matter to standardise the grades of our citrus fruit, as has been done in respect to apples packed in the standard bushel-case used generally for apples throughout the Commonwealth. The inside measurements of the case suggested are 18 in. long, 11¾ in. wide, and 10½ in. deep. This case has a capacity of 2,200 cubic inches, but is not included in the schedule of the regulations under "*The Fruit Cases Acts*, 1912-1922." The half-bushel case, No. 6 of the Schedule above referred to, is

10 in. by 11¾ in. by 5¼ in. inside measurements with a capacity of 1,100 cubic inches. The case should be suitable for oranges and the half-case of mandarins. No matter which case is used, the fruit must be sweated for seven days before it is sent to the Southern markets, in order to determine what fruit has been attacked by fruit fly, and also to enable bruised or injured fruit liable to speck to be removed prior to despatch.

Fruit fly must be fought systematically in all orchards, for if this important work is neglected there is always a very great risk of this pest causing serious loss to citrus growers.

The spotted peach moth frequently causes serious loss, especially in the case of navels. It can be treated in a similar manner to the codling moth of pip fruit, by spraying with arsenate of lead, but an even better remedy is not to grow any corn or other crop that harbours this pest in or near the orchard. Large sucking moths also damage the ripening fruit. They are easily attracted by very ripe bananas or by a water-melon cut in pieces, and can be caught or destroyed by a flare or torch when feeding on these trap fruits. If this method of destruction is followed up for a few nights, the moth will soon be thinned out.

Strawberry planting may be continued during the month, and the advice given in last month's notes still holds good. Remember that no crop gives a better return for extra care and attention in the preparation of the land and for generous manuring than the strawberry.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

THE advice given in these notes for the last few months regarding the handling, grading, and packing of fruit should still be followed carefully. The later varieties of apples and other fruits are much better keepers than earlier ripening sorts, and as they can be sent to comparatively distant markets, the necessity for very careful grading and packing is, if anything, greater than it is in the case of fruit sent to nearby markets for immediate consumption. Instruction in the most up-to-date methods of grading and packing fruit has been published by the Department, which advice and instruction should enable the growers in that district to market their produce in a much more attractive form.

The same care is necessary in the packing of grapes. Those who are not expert cannot do better than follow the methods of the most successful packers.

As soon as the crop of fruit has been disposed of, the orchard should be cleaned up, and the land worked. If this is done, many of the fruit-fly pupæ that are in the soil will be exposed to destruction in large numbers by birds, or by ants and other insects. If the ground is not worked and is covered with weed growth, there is little chance of the pupæ being destroyed.

Where citrus trees show signs of the want of water, they should be given an irrigation during the month, but if the fruit is well developed and approaching the ripening stage, it is not advisable to do more than keep the ground in a thorough state of tilth, unless the trees are suffering badly, as too much moisture is apt to produce a large, puffy fruit of poor quality and a bad shipper. A light watering is therefore all that is necessary in this case, especially if the orchard has been given the attention recommended in these notes from month to month.

Farm Notes for March.

LAND on which it is intended to plant winter cereals should be in a forward stage of preparation. Sowings of lucerne may be made at the latter end of the month on land which is free from weed growth and has been previously well prepared.

The March-April planting season has much in its favour, not the least of which is that weeds will not make such vigorous growth during the succeeding few months, and, as a consequence, the young lucerne plants will have an excellent opportunity of becoming well established.

Potato crops should be showing above ground, and should be well cultivated to keep the surface soil in good condition; also to destroy any weed growth.

In districts where blight has previously existed, or where there is the slightest possible chance of its appearing, preventive methods should be adopted—i.e., spraying with "Burgundy mixture"—when the plants are a few inches high and have formed the leaves; to be followed by a second, and, if necessary, a third spraying before the flowering stage is reached.

Maize crops which have fully ripened should be picked as soon as possible and the ears stored in well-ventilated corn cribs, or barns. Selected grain which is intended for future seed supplies should be well fumigated for twenty-four hours and subsequently aerated and stored in airtight containers. Weevils are usually very prevalent in the field at this time of the year and do considerable damage to the grain when in the husk.

The following crops for pig feed may be sown:—Mangel, sugar beet, turnips and swedes, rape, field cabbage, and carrots. Owing to the small nature of the seeds, the land should be worked up to a fine tilth before planting, and should contain ample moisture in the surface soil to ensure a good germination. Particular attention should be paid to all weed growth during the early stages of growth of the young plants.

As regular supplies of succulent fodder are essentials of success in dairying operations, consideration should be given to a definite cropping system throughout the autumn and winter, and to the preparation and manuring of the land well in advance of the periods allotted for the successive sowings of seed.

The early-planted cotton crops should be now ready for picking. This should not be done while there is any moisture on the bolls, either from showers or dew. Packed cotton showing any trace of dampness should be exposed to the sun for a few hours on tarpaulins, bags, or hessian sheets, before storage in bulk or bagging or baling for ginning. Sowings of prairie grass and *Phalaris bulbosa* (Toowoomba canary grass) may be made this month. Both are excellent winter grasses. Prairie grass does particularly well on scrub soil.

Dairymen who have maize crops which show no promise of returning satisfactory yields of grain would be well advised to convert these into ensilage to be used for winter feed. This, especially when fed in conjunction with lucerne or cowpea, is a valuable fodder. Where crops of Soudan grass, sorghum, white panicum, Japanese millet, and liberty millet have reached a suitable stage for converting into ensilage, it will be found that this method of conserving them has much to recommend it. Stacking with a framework of poles, and well weighting the fodder, is necessary for best results. All stacks should be protected from rain by topping off with a good covering of bush hay built to a fall eave and held in position by means of weighted wires.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

CLIMATOLOGICAL TABLE—DECEMBER, 1933.

Compiled from Telegraphic Reports.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·76	87	73	91	28	67	18	623	13
Herberton	..	82	65	92	30	54	12	443	14
Rockhampton	29·85	87	70	96	14	64	30	400	12
Brisbane	29·93	82	67	88	15	63	20	520	19
Darling Downs.									
Dalby	29·90	84	62	93	13	55	16, 30	224	8
Stanthorpe	..	76	57	85	8, 13	47	16	514	17
Toowoomba	..	78	59	85	13, 14	52	30	443	19
Mid-interior.									
Georgetown	29·80	93	71	99	4, 24	68	3	616	11
Longreach	29·80	94	70	102	23	59	18	321	5
Mitchell	29·87	86	62	94	31	50	18	234	8
Western.									
Burketown	29·77	94	77	105	28	70	15, 16	484	8
Boulia	29·78	99	74	107	5, 6, 25,	63	17, 18	23	2
Thargomindah	29·84	91	70	102	31	61	15, 16	229	4

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of December, in the Agricultural Districts, together with Total Rainfall during December, 1933, and 1932, for Comparison.

Divisions and Stations.	Average Rainfall. Dec.,	No. of Years' Records.	Total Rainfall. Dec., 1933.	Dec., 1932.
North Coast.	In.		In.	In.
Atherton	7·60	32	7·60	9·62
Cairns	9·06	51	7·65	15·49
Cardwell	8·22	61	22·33	9·17
Cooktown	6·84	57	6·23	9·23
Herberton	5·90	47	4·43	7·17
Ingham	6·93	41	18·50	11·43
Innisfail	12·07	52	18·92	27·01
Mossman Mill ..	11·22	20	11·89	14·84
Townsville	5·55	62	11·41	8·63
Central Coast.				
Ayr	4·14	46	2·38	4·80
Bowen	4·49	62	3·73	3·53
Charters Towers ..	3·41	51	1·77	3·09
Mackay	7·29	62	5·75	11·37
Proserpine	8·23	30	4·81	8·35
St. Lawrence ..	4·84	62	3·41	9·70
South Coast.				
Biggenden	4·53	34	6·74	2·39
Bundaberg	4·98	50	9·48	2·68
Brisbane	4·89	82	5·20	2·49
Caboolture	5·14	46	12·39	1·31
Childers	5·57	38	9·96	4·24
Crohamhurst.. ..	6·92	40	16·24	1·82
Esk	4·69	46	5·56	2·49
Gayndah	4·17	62	2·87	2·09
Gympie	5·99	63	9·24	2·67
Kilkivan	4·47	54	6·72	2·21
Maryborough ..	4·75	61	9·67	4·25
Nambour	6·78	37	13·71	3·14
Nanango	3·82	51	4·21	3·83
Rockhampton ..	4·87	62	4·00	9·54
Woodford	5·57	46	11·15	3·54

Divisions and Stations.	Average Rainfall. Dec.,	No. of Years' Records.	Total Rainfall. Dec., 1933.	Dec., 1932.
Central Highlands.	In.		In.	In.
Clermont	3·96	62	1·97	1·75
Gindie	2·90	34	0	1·53
Springsure	3·27	64	0·86	1·80
Darling Downs.				
Dalby	3·25	63	2·24	4·77
Emu Vale	3·48	37	3·70	3·28
Hermitage	2·94	27	2·40	2·86
Jimbour	3·22	45	1·87	2·98
Miles	3·07	48	3·02	2·17
Stanthorpe	3·51	60	5·14	3·10
Toowoomba ..	4·42	61	4·43	3·69
Warwick	3·39	68	3·68	3·40
Maranoa.				
Roma	2·53	59	1·18	2·61
State Farms, &c.				
Bungeworgorai ..	3·02	19	0·92	1·88
Gatton College ..	3·63	34	4·48	1·46
Kairi	6·35	19	9·70	9·49
Mackay Sugar Experiment Station	8·49	36	5·72	8·03

GEORGE G. BOND, Divisional Meteorologist.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	February. 1934.		March. 1934.		MOONRISE. Feb. 1934.	MOONRISE. Mar. 1934.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	5·24	6 46	5·45	6·25	7·40	6·11
2	5·25	6·45	5·46	6·24	8·10	6·41
2	5·26	6·44	5·46	6·22	8·38	7·11
4	5·27	6·44	5·47	6·21	9·9	7·42
5	5·28	6·43	5·48	6 20	9·41	8·18
6	5·29	6·43	5·48	6 19	10·15	8 58
7	5·30	6·42	5·49	6·18	10·57	9·44
8	5·30	6 42	5·49	6·17	11·47	10·38
9	5·31	6·41	5·50	6·16	..	11·39
					a.m.	a.m.
10	5·32	6·41	5·51	6·14	12·47	..
11	5·32	6·40	5·52	6·13	1·51	12·45
12	5·33	6·40	5·52	6·11	3·0	1·52
13	5·34	6·39	5 53	6·10	4·11	3·3
14	5·34	6·39	5·54	6·9	5·23	4·9
15	5·35	6·38	5·55	6·8	6·30	5·14
16	5·36	6·38	5·56	6·6	7·34	6·17
17	5·36	6·37	5·56	6·5	8 37	7·18
18	5 37	6·36	5·56	6 4	9·37	8·21
19	5·37	6·35	5·56	6·4	10·36	9·20
20	5·38	6·34	5·56	6·3	11·36	10·21
					p.m.	
21	5·38	6·33	5·56	6·2	12·32	11·17
22	5·39	6·32	5·56	6·1	1·28	12·12
						p.m.
23	5·39	6·31	5·56	6 1	2 22	1·2
24	5 40	6·30	5·56	6·0	3·11	1·49
25	5·41	6·29	5·57	5·58	3·35	2 32
26	5·43	6·27	5 57	5·57	4·36	3·9
27	5·44	6·26	5 58	5·55	5·9	3·41
28	5·45	6·25	5 59	5 54	5·42	4·12
29	..	..	6·0	5·52	..	4·41
30	..	..	6 1	5 51	..	5·12
31	..	..	6 2	5·50	..	5·44

Phases of the Moon, Occultations, &c.

7 Feb. ☽ Last Quarter 7 22 p.m.
14 ,, ● New Moon 10 43 a.m.
21 ,, ☾ First Quarter 4 5 p.m.

Perigee, 12th February, at 9.18 p.m.
Apogee, 24th February, at 8.12 p.m.

On the 2nd, about 7 p.m., the Moon will be passing from west to east of Neptune, 3 degrees on its south side.

Venus, which has been drawing towards the Sun for some months, will be in inferior conjunction on the 5th, when it will be on the side of its orbit nearest the earth; distant about 23,678,000 miles. On the 14th it will rise at 4.37 a.m.

Jupiter, having advanced to Right Ascension 13·27 in Virgo, will become stationary on the 7th and almost to the end of the month. Retracing its path and apparently moving westward it will pass Spica, at a distance of 4 degrees, near the middle of March.

Saturn, in Capricornus, which sets at 8.13 p.m. in the middle of January, will draw nearer the Sun and set a few minutes after it on 1st February. On the 8th it will set with the Sun, but 2 degrees further south, becoming entirely lost as an evening star. At the time of the eclipse on the 14th, Saturn will be only one degree south of the Moon.

An occultation of Antares, the brightest star in Scorpio, will occur between 7 and 8 a.m on the 9th. Observers will have to look almost overhead, especially if near Gympie or Maryborough. On the same day a very close conjunction of Mercury and Mars, in Aquarius, will occur about 9 a.m. in the north-east in broad daylight. Mercury will set 51 minutes after the Sun on the 9th, but after sunset may be noticeable in the twilight Mercury sets at 7.20 p.m. on 1st February, and at 7.31 p.m. on the 14th, while Mars sets at 7.42 p.m. on the 1st and at 7.22 p.m. on the 15th.

What will be a total eclipse of the Sun to observers situated in the Pacific Ocean, between Alaska and New Guinea, will be a partial eclipse at Hong Kong, magnitude 0 5, and visible in Queensland as a partial eclipse of less magnitude before 9 a.m.

Mars will be only 3 degrees south of the Moon at 11 a.m. on the 15th. Binoculars or telescope will be necessary to see it. Eight hours later Mercury, in Aquarius, will be only 2 degrees south of the Moon when setting. On the 18th, Mercury will be at its greatest eastern elongation, 18 degrees from the Sun.

On the 24th, Mercury and Venus will become stationary, having reached their greatest eastern position in Aquarius and Capricornus respectively.

1 Mar. ○ Full Moon 8 26 p.m.
9 ,, ☽ Last Quarter 4 6 a.m.
15 ,, ● New Moon 10 8 p.m.
23 ,, ☾ First Quarter 11 44 a.m.

Perigee, 12th March, at 7.42 p.m.
Apogee, 24th March, at 3.54 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes, at St George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

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QUEENSLAND AGRICULTURAL JOURNAL

VOL. XLI. 1 MARCH, 1934. PART 3.

Event and Comment.

Co-ordinating Agricultural Research.

AMONG the many important matters discussed at the annual conference of Ministers for Agriculture at Hobart last month was the need for co-ordinating the research and experimental work of the different States of the Commonwealth. The Queensland Minister (Hon. Frank W. Bulcock) said that overlapping and duplication occurred, and suggested the setting up of an organisation representative of the States, so that specific problems might be allotted to each State for investigation and, if possible, solution. He further suggested that State officers should confer on the proposal for establishing a basis for co-ordination.

Recommendations adopted by the conference included the following:—That eggs should be branded "chilled" before being placed in cold storage, except eggs intended for oversea export, which should be placed in cool storage in bond; that, to improve the quality of butter, dairy laboratories should be established in all States; that provision should be made in each State for registration of premises used for cool storage of eggs and other products; that the States should consider the possibility of adopting the Canadian system of regulating hatcheries; that the practice of taking an annual census of wheat varieties should be adopted by all States; that each State should undertake investigation work to improve the milling and baking quality of wheat; that action should be

taken to prevent the introduction of plant diseases in imported seed, and that the Federal authorities should consult State departments about the methods to be adopted; that States interested in tobacco production should consider the introduction of legislation similar to that in Queensland for preventing disease; that legislation for the branding of hides on economic lines should be adopted in all States; and that legislation controlling veterinary biological products should provide that no person except a qualified veterinary surgeon should use vaccine serum or a diagnostic agent without a permit or license.

Improving a National Asset.

COMMENTING on a report on grass experiments at Bybera, in the Goondiwindi district, which he had received recently from Dr. Hirschfeld, the Minister for Agriculture, Mr. Bulcock, commended this and similar projects for improving a national asset. Dr. Hirschfeld, he said, was performing a national work, and was not asking the department for financial assistance in the undertaking. He would be safe in saying that no individual within the State was making a greater contribution to the knowledge of grasses than that gentleman.

Seed should not, according to the report, be planted for pastoral purposes in small plots, as the wind carried it from one plot to another, and might falsify results. Experiments extending over one or two years furnished no definite conclusions, but the best instance was furnished by the Buffel grass. Dr. Hirschfeld added that he was concerned over his failure to obtain anything like a fair growth of the different varieties of saltbush, particularly old man saltbush. This failure was all the more remarkable as some of the saltbushes grew naturally on the place, though not abundantly.

Regarding Flinders and Mitchell grasses, Dr. Hirschfeld is quite satisfied that the results of the experiments on Bybera will bear nation-wide fruit. It is clear, however, that the experiments represent only the first stage of the work. The second stage, on which Dr. Hirschfeld and his son, Mr. R. S. Hirschfeld, intend to embark later, will be to ascertain the reaction of stock to the grasses, as the final judges are the bullock and the sheep. Dr. Hirschfeld's report concludes with the statement that whatever results are obtained will not only be for private use, but will be at the disposal of all the people of the West.

The Queensland Meat Industry.

"IT is certainly essential to develop the export market . . . and it is necessary to co-ordinate domestic with overseas markets, for the exporter must be assured of profitable working and steady supplies." Those remarks were among the chief points of the opening address by the Minister for Agriculture (Mr. Bulcock) at the recent conference of representatives of the meat industry in Brisbane. Mr. Bulcock, in the course of further remarks, said that the conference had been convened under his presidency at the request of the Premier (Hon. W. Forgan Smith), who, he regretted, was unable to preside, on account of his being otherwise engaged at the Premiers' Conference in Melbourne. Continuing, he said that he had the assurance of the Premier that the

Government desired the devising of some effective means whereby the interests of the industry might be actively and adequately promoted. The Premier was convinced that some basis of organisation satisfactory to all concerned could be evolved, and hoped that the conference would be frank and complete in its recommendations, which would be considered on the Premier's return from the South.

It was certainly essential, added the Minister, to develop the export market, and he had observed with satisfaction that the producers' organisations had already arrived at the conclusion that it was necessary to co-ordinate domestic with overseas markets, and that the exporter must be assured of profitable working and continuity of supplies. He was convinced that for marketing boards to succeed a high degree of efficiency was required, and he believed that in the near future all the commodity boards in Queensland would be asked individually to become associated with the development of further markets. In formulating any plans for any new organisation that was contemplated, he hoped that the fact would not be lost sight of that the consumer had a right to consideration; also that efficiency in production was demanded by modern marketing methods. Stabilisation of prices must be backed by efficiency in organisation; otherwise the results sought would not be achieved. Any proposals submitted should lead to the material and progressive elevation of the standard of the industry. Information had been received from overseas that in many cases our meat had not compared favourably in quality with meat from other countries. It was essential, therefore, to strive to maintain a degree of efficiency in production, treatment, and transport comparable at least with that of our competitors on the markets abroad. Other matters which merited consideration at the conference were the provisions of the Ottawa Agreement relating to the supply of meat to the British market; proper provision for the domestic meat supply at wholesale prices to be determined by an independent tribunal on lines similar to the Cane Prices Board; provision for the purchase of vealers from farmers to supply the local retail trade, as well as the export market; a conference with pig raisers as to the best means of arranging for the disposal of fresh pork. Definite protection would have to be given to the pig raising industry, remarked Mr. Bulcock, as it had not yet been correlated with other branches of the meat industry.

In the course of the general discussion that ensued, it was plain that the consensus of opinion was definitely in favour of the complete organisation of the meat industry on lines similar to that governing other primary industries in Queensland. The Government, it was suggested, might be requested to proclaim meat as a commodity under the Primary Producers' Organisation Acts to enable a poll to be taken of the meat producers of the State to determine whether they would be in favour of such an organisation. A committee was appointed to consider this suggestion in all its implications, and, if adopted, to submit a recommendation regarding a proclamation to the Government for approval.

The Sugar Industry—Surplus Production Problem.

ADDRESS BY THE PREMIER.

Subjoined is the full text of the notable address with which the Premier, Hon. W. Forgan Smith, opened the recent Conference of representatives of every section of the Queensland Sugar Industry in Brisbane. At that Conference the Peak Year Scheme was discussed, and the principles underlying it were unanimously reaffirmed.

The Premier's appreciation of the surplus production problem will be read with interest by all concerned with the welfare and progress of one of Australia's greatest agricultural industries.—Editor.

IN his opening address at the Sugar Conference in the Land Court, Brisbane, on 24th January, the Premier, Hon. W. Forgan Smith, said:—

I desire, on behalf of the Government of Queensland, to welcome you to this Conference and to express the desire that the work of the Conference will be in the interests of the State and of the industry.

Important questions of policy, as well as those of domestic concern, that are exercising the minds of those engaged in the industry at the present time were the factors which influenced the Government in convening this Conference.

It is the desire of the Government to obtain an expression of views from the industry upon such subjects.

It is not the intention of the Government that the Conference should go into minute details, nor is it intended to interfere in any way with the duly constituted tribunals functioning in connection with the industry. There are, however, large questions of principle which are vital to the well-being of the industry, and which might be taken into consideration by this Conference.

For instance, the Government has received representations regarding the relationship between the peak year quotas and the areas assigned. As to the Peak Year Scheme: this operated, it will be remembered, as from the 1930 crop, and the principle it enunciated was accepted as part of the 1931 Sugar Agreement between the Commonwealth and the State Governments. It has also been affirmed by the Sugar Associations at their annual conferences; and there is also this point, that, whilst the Peak Year Scheme was put into force by the Government of my predecessor, I recall the fact that, at the request of the industry following the conference last year with the Commonwealth Government at which Senator McLachlan presided, the present Government became a party to it.

Solvent Demand and Increased Productivity.

I have stated on previous occasions that the restriction of production is akin to a policy of despair, and I believe that world progress depends on the increasing of solvent demand and the sharing by all industrious people in the increased productivity that modern methods in industry and agriculture have made available to mankind. The world position, however, must be viewed from those angles that have emerged from time to time. In this respect the world's sugar position is in a deplorable state.

The World Sugar Position—Possible Future Developments.

Recent happenings that may portend developments in the near future are as follows:—

(1) The differentiation in regard to British preference as between sugar from the British Crown Colonies and the Dominions.—It was announced in the 1932 Budget Statement of the British Chancellor of the Exchequer that there would be an increased preference of 1s. per cwt. on all Colonial sugar entering the United Kingdom market during the next five years. No alteration, however, was made so far as Dominion sugars were concerned.

(2) Request from the Sugar Federation of the British Empire by deputation to the British Government in March, 1932 (with which the Acting Agent-General for Queensland was associated)—that the duty on foreign sugar entering the United Kingdom market be increased.—This was found unacceptable to the British Government.

(3) The Ottawa Conference.—The existing preferential margin on sugar in the United Kingdom market was stabilised until August, 1937.

(4) The Beet Sugar Industry.—Information in the Government's possession shows clearly that the Imperial Government is determined to encourage and pursue their policy of assisting by subsidy or otherwise the home beet industry in Great Britain.

(5) The World Economic Conference.—The United Kingdom Government was then anxious for the various sugar-producing countries represented on the Sugar Committee to arrive at some agreement based on the principle of restriction and stabilisation of supplies.

A statement in the House of Commons on 30th November, 1933, by Sir Philip Cunliffe-Lister, the Colonial Secretary, emphasised the British Government's views on the need for sugar regulation. In the course of a considered statement the Colonial Secretary said:—

> "At present the world's potential output of sugar is very largely in excess of the figures of consumption. That excess of productive power is partly held in check by an agreement between the principal exporting countries; but without a continuation and an extension of that agreement, there is a real risk of such an unregulated flow of sugar on the market as will lead to a complete collapse in price."

That statement is one worthy of very serious consideration by the sugar-producing interests of this State. The Agent-General in London has kept the Government fully informed of the overseas position.

The differentiation as between preference on Colonial and Dominion sugars entering the United Kingdom market illustrates an event which might be regarded as a precedent by interested parties, in further limiting the export of sugar from the Dominions to Great Britain.

I may say that in the representation made to the Secretary of State for the Dominions urging that Dominion sugar may be placed on the same basis as sugar from Crown Colonies, a statement was made by Mr. Thomas that the British Government owed a responsibility to these Crown Colonies that did not exist to anything like the same extent in regard to countries having complete Dominion status. Such a differentiation, if continued or enlarged, would intensify our difficulties here. It is not suggested that these things may happen, but reference is made to them to indicate the close touch which the Government is maintaining with the trend of events on the overseas markets. The matters just mentioned were reviewed succinctly in the last report of the Agent-General presented to Parliament last year.

The Difficulty of the Sugar Situation in Queensland.

The Government recognises the difficulty of the position. On one hand, it is claimed from certain areas that the net area assigned by a duly constituted tribunal represents such a quantity of excess sugar as to seriously affect their returns. On the other hand, it is stated that to reverse the position would be to pass on to others not responsible and less able to bear it the loss referred to.

The question of anomalies has been looked into. It is found that certain areas with complaints of unfair treatment—notwithstanding, or because of excess production—have greater tonnages per farmer and greater returns per farmer than certain other districts.

The Price of Sugar—Queensland Opposition to Reduction.

In regard to the price of sugar, the Queensland Government strenuously opposed the reduction made at the instance of the Commonwealth Government, but, in accordance with its practice, acceded to the industry's representations in this connection.

Restrictions and quotas have been advocated and made in respect of such commodities as meat and butter. Restrictions have been effected in regard to these commodities, and further restrictions are indicated from time to time by the central authority in London, so that the policy of definite restriction, or at least control of market conditions, can be regarded as an established fact, whether we like it or not; and we as a Conference must look these facts in the face and shape our policy accordingly.

This brief review will serve to illustrate the position as it exists to-day. It indicates the trend of world events and their relation to sugar supplies from the sugar-producing countries.

The Peak Year Scheme.

The provision of the Peak Year Scheme is associated with the facts as described in this review, particularly in respect to any questions of increasing the peak year tonnage *in toto*.

As to matters under our own control, the Government has had requests for inquiries by tribunals in regard to assignments, peak year,

&c., but we have considered it desirable to take the industry into our confidence and have the benefit of the views expressed at this Conference. A conference, such as has been convened, was responsible for the present system, and within the limits allowed under the Sugar Agreement at present existing between the Commonwealth and the State, the Government seeks to ascertain your views.

The Sugar Embargo.

Then there are other factors—

1. The embargo has been given to the industry on account of the importance of settlement and employment in Northern Australia.
2. The embargo carries with it important obligations in this regard.
3. These considerations must be carefully weighed as against the effect which excess production has upon the financial returns to producers engaged in the industry.

The Conference will undoubtedly recognise the importance of these phases of its deliberations.

Co-operation Essential.

Co-operation in the industry is essential. I ask delegates to cast aside any preconceived ideas, and debate the matter for the advice of the Government and for the ultimate benefit of the industry and the State.

The Premier's address was listened to attentively, and was applauded most cordially.

Covered Smut of Barley.

By R. B. MORWOOD, M.Sc., Assistant Plant Pathologist.

COVERED smut of barley frequently reduces the yield and, to a more marked extent, the quality of barley crops in Queensland. The disease can first be observed when the plant comes into ear. In the affected plant the grain with its enclosing glumes is replaced by a compact black mass, which consists of countless numbers of minute black spores. When a crop containing diseased plants is harvested, the spores lodge on the unaffected seed and between the adherent glumes of such seed. If seed contaminated with spores is planted, the spores germinate at the same time as the seed and infect the seedling. The infection cannot be observed in the growing plant as it only makes itself apparent just prior to the following harvest.

Control.

The only stage in the life history of the fungus which offers a reasonable opportunity for controlling the disease is that in which the spores are adhering to the grain. If the spores can be destroyed or rendered innocuous by the application of a suitable fungicide to the grain, then no infection could take place. Experiments to determine the best methods of treating the grain for this purpose have been conducted in England,[1] America,[2, 3, 4, 5, 6] and New Zealand[7]. The results obtained showed that the wet treatment with bluestone and dry treatment with copper carbonate, which are in general use for the control of bunt of wheat, were not satisfactory for barley or, rather, were satisfactory only in the case of skinless barley.[8] On the other hand, formalin and a number of solutions containing mercury compounds were found to give good control of the disease. Treatments with dusts other than copper carbonate have been tried with varying success. Those found to be best were Hochst, Abavit B, and Ceresan, the active constituents of which are mercury compounds, and the formalin dust Smuttox. Numerous other mercury dusts, when tested, proved ineffective or only partially effective. Smut can be eliminated from barley seed by treatment with hot water at certain temperatures without destroying the viability of the grain.[7] Considerable apparatus and skill are required for the operation. It can be used for the treatment of a small quantity of seed which can be grown in isolation and the resultant seed, if uncontaminated, used for the following season without treatment. This system has been successfully applied in one district in New Zealand[9] by a seed firm which has the necessary facilities for treatment, growing the treated seed and harvesting the resultant crop without allowing contamination. Detailed discussion of the hot water treatment is not included in these notes, as it is not considered practicable for recommendaion to individual farmers.

Queensland Experiments.

A preliminary trial was carried out in 1931 to test the relative values of a number of methods of seed treatment.[10] Nine of these were included using plots each of a single drill two chains long and replicated six times. The results, though meagre, indicated the ineffectiveness of copper carbonate and suggested that the organic mercury dusts might compare favourably with formalin. This result was followed up the next year by another series of single drill plots, and a second experiment using larger drill-sown plots in which only three treatments were used. The former yielded no results owing to the failure of the plants to mature

under the dry conditions prevailing in the district in which they were sown. The drill-sown plots were planted on Mr. W. Franke's farm at Nobby where they met with more favourable conditions.

The experiment consisted of the comparative trials of three fungicides—formalin used in solution and two mercury dusts—Tillantin R and Abavit B. Approximately one bushel of smutted seed was treated with each and sown in nine plots, three for each treatment. A strip was also planted with untreated smutted seed. The seed was planted on the day after it was treated. The stand obtained in all plots was good, and a count of seedlings in selected areas showed no significant loss of germination for any seed treatment. However, laboratory germination tests started a few days later indicated that the seed treated with formalin deteriorated rapidly after treatment. There was no such effect with the dusts.

At harvest time the untreated plot developed a serious amount of smut. A count of a few sample areas gave the proportion of smutted ears as 7 per cent. This amount would on threshing result in a heavily smutted sample of seed. With formalin and Tillantin R the proportion was reduced to 0·2 per cent., and with Abavit B no trace of smut could be found. The figures below for the number of infected plants in two rows each 12 chains long of each plot give some indication of the relative values of the treatments.

Treatment.	First Plot.	Second Plot.	Third Plot.	Average.
Untreated	215	..		215
Formalin .	2	1	10	4·3
Abavit B	0	0	0	0
Tillantin R	7	6	6	6·3

These results were striking, and it was decided to attempt to confirm the apparent outstanding value of Abavit B, and to this end a series of trials was carried out in 1933. Drill-sown plots were again put in on Mr. Franke's farm to compare three seed treatments, namely, formalin, Abavit B, and bluestone, and single drill plots on the Roma State Farm.

Single Drill Plots.

In the second experiment the single drill plots were used to test a greater variety of materials and, in some instances, different strengths of the substance. Unfortunately, the degree of infection which developed in this experiment was somewhat low, and as the plots were small and replicated only three times, the results were not as conclusive as could be desired. The experiment demonstrated differences between untreated and treated seed, but failed to sort out the substances which were partially effective from those of greater value. However, it allowed of the making of accurate counts of the germination of the seed after the various treatments. These counts indicated that there was no significant loss of germination with any treatment excepting when formalin was tried at a strength greater than that normally recommended, or with longer periods of immersion. Formalin treatment consisting of the dipping of the seed for ten minutes in a solution of formalin made up at the rate of 1 lb. to 30 gallons of water does not reduce the percentage germination of the seed if it is planted in moist soil on the day following treatment.

The smut developing in the single drill plots indicated that copper carbonate and one of the organic mercury compounds, namely, Tillantin R, are only partially effective against barley smut. Furthermore, Abavit B, which had previously proved very effective when applied at the rate of 2 oz. per bushel, lost its efficiency with any reduction of the amount below this figure.

Drill-sown Plots.

The drill-sown experiment consisted of plots four hoes wide and 12 chains long. Thirty plots were sown, being ten replications of three treatments. A single 12-chain strip the full width of the fourteen-hoe drill was planted with untreated seed along one end of the paddock where it could be conveniently destroyed prior to harvest. A commercial sowing of about seven acres was made with seed treated by the method giving the best results last year, namely, Abavit B at the rate of 2 oz. per bushel. The same seed was used throughout. It was obtained from a lightly smutted crop and had been cleaned and freed from smut balls. No further artificial infection was attempted.

One bushel of seed was used for each of the three treatments for the small replicated plots. The treatments were as follows:—

(1) Bluestone.—The seed was dipped into a 1½ per cent. solution of bluestone for three minutes. It was then spread out to dry.

(2) Abavit B.—The seed was dusted with Abavit B at the rate of 1 oz. per bushel by rotation in a closed box.

(3) Formalin.—The seed was dipped into a 1 : 240 solution of formalin for ten minutes. This solution is equivalent to 1 pint of formalin in 30 gallons of water. The seed was then heaped and covered with a bag which had been soaked in the solution. It was then left overnight and bagged and sown next morning.

Results.

A severe attack of corn-ear worm destroyed a portion of the crop, but sufficient remained to show definite evidence of the value of formalin and of Abavit B used at full strength. Table I. gives the numbers of smutted plants per plot. Table II. gives the approximate percentage of infected plants obtained from the average of these figures, and also estimates of the amount of smut in the commercial planting and in the untreated strip. The estimates for the last two were obtained by counts of areas comparable to the plots, chosen at random through the crop and strip respectively. Corresponding figures for the previous year's experiment are included for comparison.

TABLE I.

Treatment	Number of Smutted Plants per Plot.										Average.
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	
Bluestone, 1½ per cent., 3 min.	14	27	21	30	19	20	25	28	16	31	23·1
Abavit B, 1 oz. per bus.	17	25	15	23	20	10	21	25	30	21	21·2
Formalin, 1 : 240, 10 min.	2	4	1	3	3	1	2	1	0	1	1·8

TABLE II.

ESTIMATED AVERAGE PERCENTAGE SMUTTED PLANTS.

Treatment.	1932.	1933.
Bluestone, 1½ per cent., 3 min. dip ..	..	0·23
Abavit B, 1 oz. per bus.	..	0·21
Formalin, 1 : 240, 10 min. dip ..	0·15	0·02
Abavit B, 2 oz. per bus.	..	0·02
Untreated	7·00	4·20
Tillantin R	0·20	..

The degree of control exercised by formalin and Abavit B at the rate of 2 oz. per bushel could be classed as good commercial control. No doubt even better results would be obtained by the use of seed reasonably free from smut in the first instance.

Discussion.

At the conclusion of three years' experiments in the control of barley smut there appear to be two substances of considerable merit, namely, Abavit B and formalin.

The use of the dust Abavit B has several advantages over the liquid treatment with formalin. It has given more consistently good results in the trials. It is easier to apply and has no detrimental effect on the germination of the seed. Formalin probably always slightly retards germination, and will, if incorrectly applied or used under adverse conditions, seriously reduce the total germination. Further, the dust can be applied at any time and the treated seed stored indefinitely; in fact, owing to the protection from weevils afforded by the dust, treated seed is likely to keep better than untreated grain. The risk of recontamination with smut is a factor for consideration when formalin is used, but not for Abavit B, as the latter remains on the grain and will deal as effectively with smut spores received after treatment as with those present before. Treatment with Abavit B does not appreciably alter the rate at which the seed runs through the drill, as does the wet treatment.

The advantages in the use of formalin are the lower cost of materials and the non-poisonous nature of the seed after treatment.

It is proposed to continue the seed treatment trials along two lines, namely, the testing of other methods of treatment with formalin and of mercury dusts other than Abavit B. Certain of these latter have given good results overseas and in preliminary trials in Queensland.

Methods of Seed Treatment.

Abavit B should be applied at the rate of 2 oz. of the powder to each bushel of barley. It should be thoroughly mixed in a rotating, dust-tight container such as is used for the treatment of wheat with copper carbonate. Those unfamiliar with this piece of apparatus can obtain particulars of construction from this Department. Owing to the highly poisonous nature of the dust, all seed treated with Abavit B should be planted to avoid the possibility of its being consumed by domestic animals.

The formalin should be diluted by adding 1 pint of commercial (40 per cent.) formalin to 30 gallons of water. A suitable quantity of the seed should be placed loosely in an open bag and dipped into the solution. It should be stirred to ensure of the wetting of all the grain and allowed to remain in the solution for ten minutes. Excess solution should then be drained back into the container and the seed heaped and covered with bags soaked in the solution. Meanwhile further quantities of seed may be dipped in the same solution, more of the mixture of water and formalin being added to make up for that carried away on the grain. Seed so treated should be sown the following day in a good moist seedbed.

Formalin is poisonous, but after the fumes have evaporated from the seed it is no longer poisoned. Recontamination of the treated grain by the use of smutty bags, &c., should be avoided. The treated seed will not flow through the drill as readily as untreated, so the drill should be set to a higher rate of seeding than that required for the latter.

Acknowledgments.

Special acknowledgment is made of the help received from Mr. W. Franke and Mr. Soutter and the staff of the State Farm, Roma, who provided both the facilities and assistance for carrying out the experiments. Mr. A. C. V. Bligh kindly supplied samples of Abavit B.

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Bunchy Top of the Banana and its Control.

By J. H. SIMMONDS, M.Sc., Plant Pathologist.

THE occasional outbreak of bunchy top in plantations situated some distance from all known sources of infection makes it imperative that every banana-grower should be familiar with this disease even though it has not been found in his vicinity. The following short account has therefore been prepared for those who are unacquainted with this malady.

How to Recognise Bunchy Top.

A plant which has had bunchy top for some time is easily recognised, since once it has been infected all the new leaves produced take on a characteristic appearance. For example, the youngest leaf unfolds in a somewhat restricted manner. The edges appear to be contracted, so that each side of the blade tends to remain curled upwards and inwards to a greater extent than in the healthy plant. The older leaves, instead of having enlarged and expanded naturally, are seen to be shorter and narrower than normal. They have a margin which is decidedly waved, with usually a pronounced upward curving. These leaves have a stiff appearance, and are brittle when crushed. The leaf stalk is shortened and fails to bend over in the usual graceful way. The combined result is that the short, narrow leaves are borne in a stiff, erect, and crowded manner, from which is derived the name of bunchy top (Plate 73).

However, no grower should allow a plant infected with bunchy top to remain in his plantation long enough for these advanced stages to be obvious. The plantation should be carefully examined at regular intervals for any plant showing in the slightest degree an abnormal appearance. Especially should the grower investigate plants whose youngest leaves exhibit a lighter green colour along the edge and have blades which dip back from the midrib and curve in again conspicuously from the margin (Plate 74). Any suspicious plant should then be more closely examined for certain characteristic symptoms which are present even in the early stages of the disease. These symptoms are seen by examining the base of the youngest leaf from the under side and with the light behind it. If the plant is infected there will be noticed short, broken, or sometimes continuous lines of a dark-green colour lying between, and parallel to, the clear veins which run out at right-angles to the midrib (Plate 72). There are also often one or more wider dark-green streaks running down the outside of the leaf stalk near its junction with the pseudostem.

Points Concerning the Nature and Spread of Bunchy Top.

Before proceeding to discuss the steps necessary to overcome bunchy top it is important that the reader should know something of the nature of the disease and the means by which it is spread. Bunchy top is unlike the majority of plant diseases, in that it is not caused by a fungus or bacterial organism, but by an infectious agent smaller than any of these—so minute, in fact, that it can not be seen even with a high-power microscope. This causal agent, or virus, as it is commonly called, is located in the sap of an infected plant.

In a single stool the virus from a diseased parent plant may travel in the sap stream down to the corm, and out through the connecting tissue to the young suckers, which will in turn develop the disease (Plate 73). Hence the necessity for two features in the control methods outlined later; namely, the eradication of the whole of the stool rather than merely the plant showing symptoms at the time, and the securing of suckers from bunchy top free plantations.

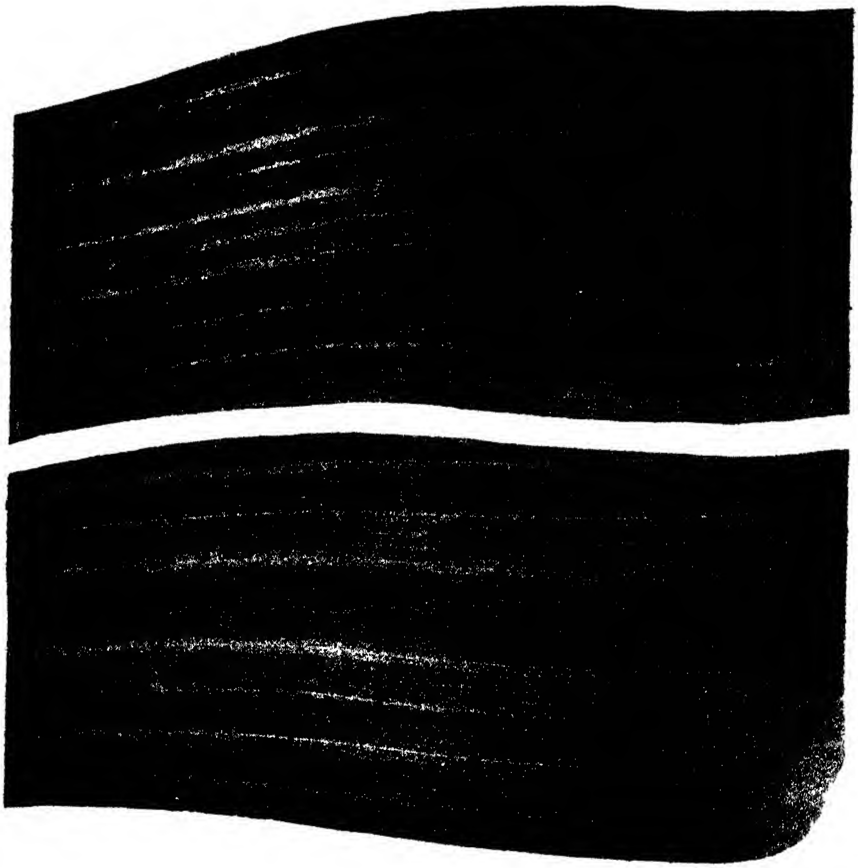

PLATE 72.

Portions of banana leaves photographed from the underside by both transmitted and reflected light. Above: Leaf from bunchy top infected plant showing the characteristic dark dots, dashes, and lines. Below: Leaf from a healthy plant for comparison.

To transmit bunchy top to a plant in another stool it is necessary to transfer the virus-containing sap from an infected plant to a healthy one. Under natural conditions this is done by the banana aphis when it sucks the sap of a diseased plant and then leaves it to feed on a healthy one. Aphids may travel for considerable distances in the air, which accounts for isolated outbreaks of bunchy top in plantations otherwise free from the disease.

The active part taken by the banana aphis in spreading bunchy top explains why the destruction of all aphids on infected plants is an important part of the control measures discussed below. The banana aphis is so widely distributed that an attempt to control bunchy top by the total eradication of this insect throughout a whole plantation is considered commercially impractical.

Once a banana plant is infected the virus never leaves it. There is no known method of destroying the virus in the plant by the application of chemicals or otherwise, except by destroying the plant itself. In other words, it is not possible to cure a plant of bunchy top.

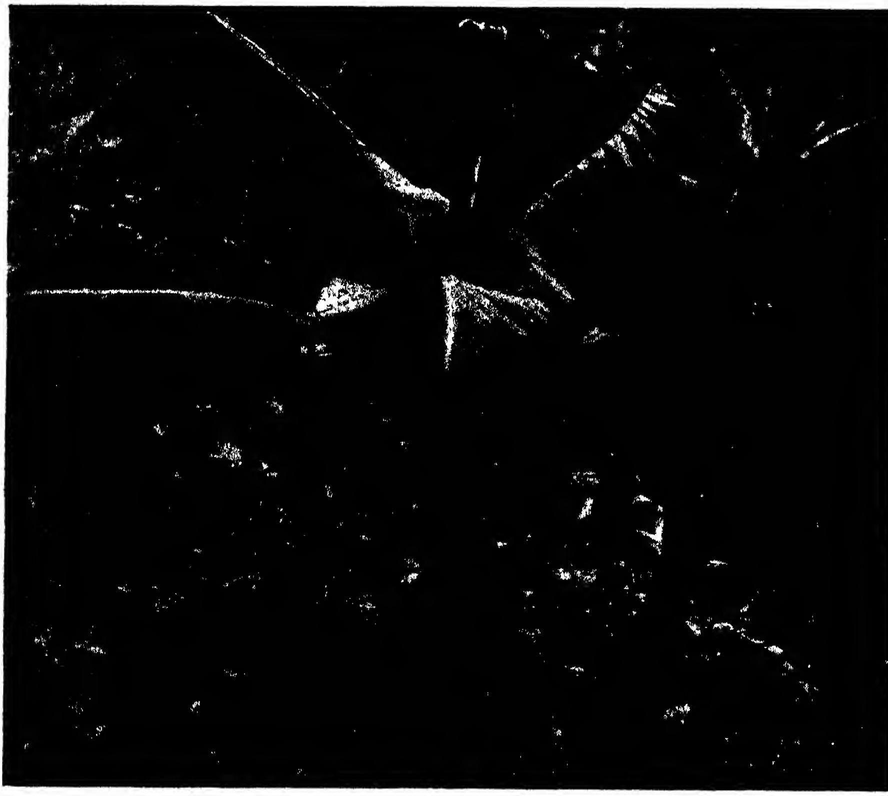

PLATE 73.

The result of not completely eradicating a stool in which bunchy top has appeared. The plant on the right shows primary infection with bunchy top contracted when as a sucker it had direct union with a diseased parent before the latter was removed. The plant on the left is healthy.

The Control of Bunchy Top.

From the foregoing remarks it will be seen that there are two main aspects in the control of bunchy top. Firstly, care must be taken that all suckers used for planting material are free from bunchy top infection. Secondly, the number of bunchy top infected plants must be reduced to the absolute minimum by their eradication as soon as disease symptoms appear. By this means the source of supply of the virus is eliminated.

The Banana Industry Protection Board has been giving considerable attention to the control of bunchy top. The Board's agents are in a

position to advise where suitable material, free from bunchy top, may be obtained. When considering planting, growers should apply to their local agent for information on the planting policy in their district, as a planting permit may have to be refused if it is considered that the spreading of bunchy top or other disease or pest is involved.

For the location of bunchy top plants in his plantation the grower must not depend on the occasional visits of the banana agent, but must himself make regular and systematic search for diseased plants. If an infected plant is found, it and any associated aphids must be immediately destroyed, as otherwise it remains a menace to healthy plants in the same or adjoining plantations.

PLATE 74.

Two banana plants showing the symptoms of a fairly recent infection with bunchy top. In the younger leaves notice the dipping back of the blades from the midrib and the incurved and waved condition of the margin.

In order that the eradication operation may be uniformly effective, the following procedure must be followed. First pour not less than half a pint of pure kerosene into the central leaf of the affected plant, and allow it to trickle down round the leaf bases, so that all aphids present may be killed. After waiting for a few hours for this to take place, dig out the plant, together with any other plants and suckers connected with it in the stool. Finally chop the plants into small pieces to facilitate drying. As a further precaution, the plants associated with the affected one in the stool should also be kerosened before removal.

With strict attention to these matters bunchy top need never become a serious disease, but if the work is allowed to become haphazard, only a disaster such as attended the Currumbin and Tweed growers some years ago may be expected.

Worm Parasites of Domesticated Animals in Queensland.

By F. H. S. ROBERTS, M.Sc., Entomologist, Animal Health Station, Yeerongpilly.

THESE notes are intended as a check list of the worm parasites so far collected from the domesticated animals in Queensland. The majority have already been recorded by Johnston *et al.*, but during the past three years a number of species have been obtained by the writer which had not previously been known from this State. The material examined was obtained mainly from animals slaughtered at the Brisbane Abattoir and from animals used for experimental purposes at this station. A small portion consisted of specimens forwarded from various parts of Queensland for identification. The dog, cat, and horse have, so far, been given very little attention, consequently the parasites recorded from these animals are relatively few.

Nematoda.

Strongyloides sp.—These tiny nematodes are exceedingly numerous in cattle, sheep, and pigs.

Trichuris trichuria (L., 1771).—Very common in the pig and often present in very large numbers.

Trichuris ovis (Abild., 1795).—Frequently found in the cæcum and colon of cattle and sheep.

Capillaria retusa (Raill., 1893).—Very common and numerous in the intestine of the domestic fowl.

Capillaria columbæ (Rud., 1819).—This species has been found in the small intestine of the domestic fowl and domestic pigeon.

Strongylus equinus (Mul., 1780).—Specimens from the large intestine of the horse have frequently been seen and indicate that this species has a wide distribution throughout the State.

Strongylus vulgaris (Looss, 1900).—This species is also a common parasite of the horse, occurring over a wide area.

Strongylus edentatus (Looss, 1900).—This Strongylus does not appear to be as common as *S. vulgaris* and *S. equinus*.

Trichonema sp.—There are at least about ten species of this and allied genera from the horse in the collection. Johnston has recorded *Trichonema tetracanthum*. The Trichonemas are small worms occurring in the cæcum and colon of the horse, and in their immature stages cause nodule formation in the intestinal wall.

Œsophagostomum columbianum Curtice, 1890.—The sheep nodule worm is extremely common and is a widely distributed sheep helminth. The excellent condition of many sheep killed at the abattoir in which the intestines were simply riddled with nodules would indicate that the species is comparatively harmless. Grown sheep certainly appear able to resist infestation by this worm to a large extent, but among young animals the parasite must be regarded as being definitely harmful, the effect of its presence being mainly shown by the failure to make normal growth. The sheep nodule worm is also recorded from cattle and goats

Œsophagostomum radiatum (Rud., 1803).—The nodule worm of cattle is also well distributed and frequently seen.

Œsophagostomum dentatum (Rud., 1803).—This is the common nodule worm of pigs and is considered to be one of the most prevalent worm parasites of this animal in Queensland.

Œsophagostomum longicaudum Goodey, 1925.—This strongyle is only occasionally seen and is usually found in company with *O. dentatum.* It may be readily recognised by the position of the cervical papillæ, by the long tail of the female, and the vase-like shape of the œsophagus.

Ancylostoma caninum (Erc., 1859).—Obtained on several occasions from the dog in Brisbane and Townsville. This hookworm is also frequently found in the cat.

Ancylostoma duodenale (Dubini, 1843).—Recorded by Legg and Rheuben from the intestine of the pig at Townsville.

Necator americanus (Stiles, 1902).—This species is the more common hookworm of man in Queensland and is also recorded from the pig by Legg and Rheuben.

Bunostomum phlebotomum (Rail., 1900).—This cattle hookworm is known from Brisbane and Townsville and is probably well distributed throughout at least the coastal areas of the State. It may be regarded as being a not uncommon bovine parasite, and is thought to be partly responsible for the unthriftiness of calves in areas where it is known to exist.

Stephanurus dentatus (Dies., 1839).—The pig kidney worm is very common and has an extensive distribution throughout the State, its prevalence increasing so rapidly towards the tropical portions that a very large percentage of the animals here are infested. It is responsible for severe liver damage, which results in retarding the growth of the infested animal to a very conspicuous extent. Immature specimens of this helminth have been collected on two occasions from the livers of calves.

Hæmonchus contortus (Ru., 1803).—Very common in the abomasum of sheep, cattle, and goats. It is a most pathogenic and widely distributed sheep helminth and is responsible for serious losses yearly. It is also responsible for mortalities and unthriftiness among calves, especially in the coastal areas. In cattle the linguiform process overhanging the vulva in the female is reduced to a small knob.

Nematodirus filicollis (Rud., 1802).—Taken on a few occasions from the small intestine of sheep but not regarded as being a frequent parasite.

Ostertagia circumcincta (Stad., 1894).—Frequently found in the fourth stomach of sheep, rarely in cattle. It has never been seen in large numbers, and is not regarded as a serious parasite.

Ostertagia ostertagi (Stiles, 1892).—This is one of the most frequent cattle helminths in Southern Queensland at least, but heavy infestations have not yet been observed. It has been taken on one occasion from the abomasum of the sheep in company with *O. circumcincta.*

Cooperia curticei (Rail., 1893).—Rare in the small intestine of the sheep.

Cooperia punctata (V. Linstow, 1907).—This species is represented by two males from the duodenum of a calf.

Cooperia pectinata Ransom, 1907.—Dickmans has recently drawn attention to Baylis's *C. nicolli* as a synonym of *C. pectinata.* Baylis erected his species on the larger spicules and ovijectors, the spicules being ·35 to ·39 mm. in length and the ovijectors ·48 to ·60 mm., as against Ransom's measurements for *C. pectinata,* spicules ·24 to ·28 mm. and ovijectors ·3 mm. In the series examined by the writer the spicules measured from ·24 to ·38 mm. and the ovijectors ·31 to ·58 mm. *C. pectinata* was moderately frequent in calves examined at the abattoir.

Cooperia fieldingi Baylis, 1929.—Recorded by Baylis from the small intestine of cattle in North Queensland.

Trichostrongylus extenuatus (Rail., 1898).—Very frequent in sheep though only in small numbers. This species has also been taken from cattle, and is recorded by Heyden from goats.

Trichostrongylus colubriformis (Giles, 1892).—This appears to be the most common species of Trichostrongylus in Queensland sheep. An intense survey would probably record the existence of other species of this genus. *Trichostrongylus sp.* is regarded in the Southern Australian States as an exceedingly pathogenic group, but in Queensland has been seen only in moderate numbers. Heyden records *T. colubriformis* from the goat and man.

Ornithostrongylus quadriradiatus (Stev., 1904).—Occurs in the domestic pigeon.

Hyostrongylus rubidus (Has. and Stiles, 1892).—This slender nematode has been collected on several occasions from the stomach of the pig but never in any numbers.

Metastrongylus apri (Gmel., 1790).—This lung worm of the pig is recorded from the Moreton district. It inhabits the bronchioles.

Chœrostrongylus pudendotectus (Wostokow, 1905).—A few specimens of this pig lung worm were obtained from a pig at Riverview in company with *M. apri.*

Dictyocaulus filaria (Rud., 1809).—The large lung worm of the sheep is frequent in Southern Queensland where, during the spring months especially, it is responsible for occasional losses.

Dictyocaulus viviparus (Bloch, 1782).—The cattle lung worm is very prevalent among calves of dairy cattle in Coastal Queensland, especially in the South.

Dictyocaulus arnfieldi (Cobbold, 1884).—Said by Johnston to have been reported from horses by Bancroft in 1893.

Oxyuris equi (Schrank, 1788).—Very common in the large bowel of horses.

Heterakis gallinæ (Gmel., 1790).—Very frequent in the cœcum of the domestic fowl.

Ascaris lumbricoides (L., 1758).—One of the commonest and most widely distributed parasites of the pig.

Toxocara canis (Werner, 1782).—This species is very prevalent in the small intestine of dogs.

Toxocara mystax (Zedor, 1800).—Frequent in the small intestine of the cat.

Ascaris equorum Goeze, 1782.—Very frequent in the small intestine of the horse.

Ascaridia lineata (Schneid., 1866).—Very common in the domestic fowl, especially in young birds.

Ascaridia columbæ (Gmel., 1790).—Found in the small intestine of the domestic pigeon, and regarded as being very frequent.

Habronema megastoma (Rud., 1819).—Occurs in the stomach of the horse.

Habronema microstoma (Schneid., 1866).—Found in the stomach of the horse.

Habronema muscæ (Carter, 1861).—This is the most frequently encountered of the three species of this genus. Johnston, who worked out the life histories of the three species in Queensland, found that *H. muscæ* and *H. megastoma* may be transmitted by *Musca domestica*, *M. vetustissima*, *M. fergusoni*, *M. terra-reginæ*, and *M hilli;* whilst *H. microstoma* underwent its complete larval development only in *Stomorys calcitrans.*

Arduenna strongylina (Rud., 1819).—Very common in the stomach of the pig, but seen only in small numbers.

Physocephalus sexalatus (Mol., 1860).—Frequently seen in the stomach of the pig, usually accompanied by *A. strongylina*.

Acuaria (*Cheilospirura*) *hamulosa* (Dies., 1851) —Frequent in the gizzard of the domestic fowl.

Acuaria (*Dispharynx*) *spiralis* (Mol, 1858).—Infrequent in the proventriculus of the domestic fowl.

Oxyspirura parvovum Sweet, 1910 -The eye worm of the domestic fowl is extremely common in North Queensland, but is unknown south of Rockhampton. The intermediate host of this nematode is the roach *Pycnocœlus surinamensis.*

Filaria lienalis (Stiles, 1892) —Recorded by Johnston as *Onchocerca lienalis* from the gastro-splenic ligament of cattle. The species has recently been placed in the genus *Filaria* by Sandground. It is not uncommon among Queensland cattle

Onchocerca gutterosa Neuman, 1910—Rheuben considered this species to represent the unincapsulated form of *Onchocerca gibsoni,* but in a recent revision of the genus Sandground gives it specific rank due to the constant presence of an inconspicuous dilation in the cervial region which is absent in *O. gibsoni.* Rheuben reports *O. gutterosa* as being extremely common, the principal sites of infection in the fore-quarter being the connective tissue of the *ligamentum nuchæ,* and in the subscapular connection tissue, and in the hind limb in the connective tissue below the quadriceps group of muscles and in that of the popliteal space.

Onchocerca gibsoni C. and J., 1910.—The beef nodule worm is very common and is a source of serious loss to the beef export trade. The worm is found in the region of the brisket and stifle. This species is also recorded from sheep.

Dirofilaria immitis (Leidy, 1856).—Recorded by Bancroft from the right ventricle of the dog. This filariid is said by Legg to be very common among dogs in North Queensland. Bancroft records the mosquito *Culex fatigans* as an intermediate host.

Gnathostoma hispidum Fedchenko, 1872.—This species is found in the stomach of the pig, and is represented in the collection by two specimens from the Cape York Peninsula.

Macracanthorhynchus hirudinaceus (Pallas, 1781).—The thorn-headed worm of the pig is occasionally but not frequently observed. It appears to be most common in the Beaudesert district.

Trematoda.

Paramphistomum cervi (Schrank, 1790).—This conical fluke is extremely common among cattle, especially in the coastal areas. It occurs sometimes in very great numbers in the rumen and has occasionally been seen in the reticulum, but does not appear to be in any way pathogenic. It is possible that more than one species of the genus is included here under this name.

Fasciola hepatica L., 1758.—The liver fluke has frequently been collected from the livers of cattle and sheep and on two occasions from that of the pig. There is now definite evidence that this fluke is endemic in the Maleny and Kingaroy districts in Queensland. In the Maleny district infestation of the few sheep there is comparatively common, whilst at Kingaroy the parasite was taken from the liver of a pig raised in the district. There is evidence that the species may also occur around Milmerran, but this is not conclusive. The molluscan intermediate host has not yet been determined.

Echinostomum revolutum (Frölich, 1802).—Obtained on one occasion from the rectum of the domestic duck This species has been previously recorded from the black swan (*Chenopsis atrata*), the pied goose (*Anseranas semipalmata*), the green goosetcal (*Nettopus pulchellus*), and from the black duck (*Anas superciliosa*).

Cestoda.

Moniezia expansa (Rud., 1810).—Very common among lambs, especially on the Darling Downs, among which it may be pathogenic. This species is also recorded from calves and goats.

Moniezia benedeni (Moniez, 1879).—This tapeworm has been collected from calves. It may be distinguished from *M. expansa* by the larger scolex and the linear interproglottidal glands.

Moniezia trigonophora St. and Has., 1892.—Recorded by Johnston from sheep.

Moniezia planissima St. and Has., 1892.—Recorded by Johnston from cattle. The many species of *Moniezia* recorded by Stiles and Hassell from domestic ruminants have now been reduced to three, and it is probable that Johnston's *M. trigonophora* may be referred to *M. expansa* and his *M. planissima* to *M. benedeni*.

Helictometra giardi (Moniez, 1879).—Collected on several occasions from lambs in company with *Moniezia expansa*. Specimens have been taken at Miles, Dalby, Goondiwindi, and Springsure.

Anoplocephala perfoliata (Goeze, 1782).—Recorded by Johnston from the horse.

Anoplocephala magna (Abildg., 1789).—This is a much larger species than *A. perfoliata* and may be readily distinguished by the absence of posterior lappets on the scolex. The several specimens in the collection would denote that this horse tapeworm is not uncommon.

Dipylidium caninum (L., 1758).—There are several specimens from the dog bearing this label. The majority of these are minus the scolex and have only been given this name provisionally. This species has been recorded from the cat by Johnston in which it is not uncommon.

Echinococcus granulosus (Batsch, 1786).—Hydatid cysts are not uncommon in the liver and lungs of sheep, cattle, and pigs slaughtered at the abattoir. It may be inferred that the adult is present in dogs in Queensland.

Tænia hydatigena (Pall., 1776).—The larvæ of this dog tapeworm are very common in sheep and to a lesser extent in cattle and pigs. Its presence in dogs may be inferred from the incidence of its larva, *Cysticercus teniucollis.*

Tænia tæniæformis (Rud., 1810).—Johnston records this species from the cat. Its larva, *Cysticercus fasciolaris,* occurs in the livers of rats.

Tænia saginata (Goeze, 1782).—The beef tapeworm has been recorded from man on several occasions, but no record is known of the presence of its larva, *Cysticercus bovis,* in cattle. The species is probably not endemic.

Davainea proglottina (Dav., 1860).—This tiny tape is not infrequently found in the small intestine of the domestic fowl. Heavy infestations are not uncommon and are regarded as being markedly pathogenic.

Raillietina (Raillietina) tetragona (Mol., 1858).—Occurs in the small intestine of the domestic fowl and is the commonest fowl tapeworm in Southern Queensland.

Raillietina (Skrjabinia) cesticillus (Mol., 1858).—Fairly frequent in the small intestine of the domestic fowl.

Hymenolepis carioca (Magahl., 1898).—The incidence of this tapeworm in the domestic fowl is not regarded as high, though heavy infestations have occasionally been observed.

Hymenolepis inermis Yoshida, 1910.—Not uncommon in the domestic fowl, often occurring in large numbers.

Aporina delafondi (Rail., 1892).—Recorded by Johnston from the intestine of the domestic pigeon.

Diphyllobothrium mansoni (Cobbold, 1882).—This tapeworm is of frequent occurrence in the small intestine of the cat.

Fimbriaria fasciolaris (Pall., 1781).—Two specimens of this interesting tapeworm were obtained from a domestic duck in Brisbane. In both specimens the head was replaced by a pseudoscolex.

Host List with Parasites Recorded.

SHEEP (*Ovis aries*).

Fasciola hepatica.
Moniezia expansa.
Moniezia trigonophora.
Helictometra giardi.
Cysticercus tenuicollis.
Echinococcus granulosus.
*Strongyloides sp. (papillosus?).
Hæmonchus contortus.
Ostertagia circumcincta.
*Ostertagia ostertagi.
*Cooperia curticei.
Trichostrongylus extenuatus.
*Trichostrongylus colubriformis.
*Nematodirus filicollis.
Oesophagostomum columbianum.
Dictyocaulus filaria.
Trichuris ovis.
Onchocerca gibsoni.

CATTLE (*Bos taurus*).

Paramphistomum cervi.
Fasciola hepatica.
Moniezia expansa.
Moniezia planissima.
*Moniezia benedeni.
Cysticercus bovis?
*Cysticercus tenuicollis.
Echinococcus granulosus.
Hæmonchus contortus.
*Ostertagia ostertagi.
Ostertagia circumcincta.
*Cooperia punctata.
Cooperia pectinata.
Cooperia fieldingi.
Trichostrongylus extenuatus.
*Trichostrongylus colubriformis.
Dictyocaulus viviparus.
*Stephanurus dentatus.
Oesophagostomum radiatum.
Oesophagostomum columbianum.
*Bunostomum phlebotomum.
*Strongyloides sp.
Trichuris ovis.
Filaria lienalis.
Onchocerca gutterosa.
Onchocerca gibsoni.

PIG (*Sus scrofa*).

*Fasciola hepatica.
*Echinococcus granulosus.
*Cysticercus tenuicollis.
*Strongyloides sp.
Ascaris lumbricoides.
*Oesophagostomum dentatum.
*Oesophagostomum longicaudum.
Ancylostoma duodenale.
Necator americanus.
*Metastrongylus apri.
*Chærostrongylus pudendotectus.
*Hyostrongylus rubidus.
Stephanurus dentatus.
Arduenna strongylina.
Physocephalus sexalatus.
*Gnasthostoma hispidum.
Trichuris trichuira.
*Macracanthorhynchus hirudinaceus.

GOAT (*Capra hircus*).

Echinococcus granulosus.
*Moniezia expansa.
*Hæmonchus contortus.
*Oesophagostomum columbianum.
Trichostrongylus colubriformis.
Trichostrongylus extenuatus.

HORSE (*Equus caballus*).

Anoplocephala perfoliata.
*Anoplocephala magna.
Ascaris equorum.
Oxyuris equi.
Strongylus equinus.
*Strongylus vulgaris.
*Strongylus edentatus.
Trichonema tetracanthum.
Trichonema sp.
Dictyocaulus arnfieldi.
Habronema muscæ.
Habronema microstoma.
Habronema megastoma.

DOG (*Canis familiaris*).

Dypilidium caninum.
Echinococcus granulosus.
Tænia hydatigena.
Ancylostoma caninum.
Dirofilaria immitis.
Toxocara canis.

CAT (*Felis domestica*).

Diphyllobothrium mansoni.
Tænia tæniæformis.
Dipylidium caninum.
Toxocara mystax.
Ancylostoma caninum.

FOWL (*Gallus*).

Davainea proglottina.
Raillietina (Raillietina) tetragona.
Raillietina (Skrjabinia) cesticillus.
Hymenolepis carioca.
Hymenolepis inermis.
Amœbotænia sphenoides.
Ascaridia lineata.
Heterakis gallinæ.
Capillaria retusa.
Capillaria columbæ.
Oxyspirura parvovum.
Acuaria (Cheilospirura) hamulosa.
Acuaria (Dispharynx) spiralis.

PIGEON (*Columba livia*).

Aporina delafondi.
Ascaridia columbæ.
Ornithostrongylus quadriradiatus.
Capillaria columbæ.

DUCK (*Anas boschas domestica*).

*Echinostomum revolutum.
*Fimbriaria fasciolaris.

*** Officially reported from these hosts for the first time in Queensland.**

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TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

Improvement of Stock.

In the course of a recent statement to the Press, the Minister for Agriculture and Stock, Mr. Frank W. Bulcock, said:—

TO promote production, without increasing production costs, is an aim much to be desired. Recognising this, the Government has recently given consideration to methods whereby better results will be possible of attainment in relation to dairying, pig-raising, lamb-growing, and the production of heavy horses.

Present economic conditions indicate the need for more efficient means of production, and one of the best methods of attaining efficiency in production is by the use of stock selected because of some outstanding characteristic of economic importance. Hence, it follows that the employment of high-grade sires, representing as they do the head of the herd or flock, as the case may be, will add materially to our total wealth production, while at the same time benefiting the individual engaged in production.

In the scheme now approved by the Government there is an earnest desire to promote this efficiency in production, and it is recognised that many farmers do not employ indifferent sires because they desire to do so, but in consequence of an inability to buy more suitable stock.

In the case of the dairying industry, a greater volume of production from a small herd is possible, and in departmental experience has been often achieved. The advances now contemplated, which will be made through the Rural Assistance Board, will materially help dairy farmers generally to acquire a better class of bull.

Turning to beef, with the ever-increasing competition for available markets, and the undeniable fact that we must strive to attain the highest levels reached by our competitors, it is evident that some action to assist in providing good herd bulls is necessary. It is anticipated that cattle-growers will avail themselves of the opportunities afforded under the scheme.

From time to time complaints are raised concerning the decline of heavy horse standards, and in view of the fact that the future of the heavy horse appears to be assured, provision is made for assistance to purchase Clydesdale stallions, either individually or through groups.

The looked-for development of the lamb trade cannot take place until financial assistance is forthcoming, particularly for the purchase of rams of the British breeds.

The raising of pigs has also in recent years indicated clearly the need for the attainment of a high standard of quality.

Generally speaking, the proposals outlined in the scheme should make it possible for every live-stock raiser to possess a high-grade animal, which will soon reflect its characteristics in more efficient and, therefore, more economical production.

RURAL ASSISTANCE SCHEME.

Following are particulars of the rural assistance scheme:—

Dairy Sires.

(i.) Qualifications.—Advances to be made only in respect of bulls, either registered or eligible for registration in a recognised herd book, the progeny of dams which have qualified on a production basis.

(ii.) Valuation.—The limit of valuation shall be 20 guineas, plus 2s. per lb. butter-fat over the production standard to be placed on such bulls.

(iii.) Advance.—The total advance to be 75 per cent. of 20 guineas, plus 75 per cent. of the additional purchase price accruing in respect of production records.

(iv.) Term of Loan.—Maximum five years, an interest period of twelve months and a redemption period of four years.

(v.) Age of Bull.—Nine months to five years; provided that in special cases the Board may approve of an older animal.

(vi.) Security.—Stock mortgage, assignment, or such other security as the Rural Assistance Board may require.

(vii.) Health.—T.B. test to be carried out in respect of bulls over two years of age. C.A. test to be at the discretion of the Minister.

(viii.) Group Purchases.—Any such applications received to be dealt with on their merits by the Rural Assistance Board.

Sheep.

To encourage the early lamb industry advances may be made for the purchase of up to 100 merino ewes and two rams of British breeds. In the case of established flocks, advances may be made for the purchase of up to ten British-breed rams (on a 2 per cent. basis). The valuation of rams to be 50 per cent. of 5 guineas, plus 50 per cent. of freight. The basis of advance to be 50 per cent. of landed cost. The loan to be for a maximum of four years, an interest period of twelve months and a redemption period of three years.

Security.—Stock mortgage and wool lien, if practicable. In particular cases the security to be at the discretion of the Rural Assistance Board.

Beef Bulls.

Qualification.—Bulls to be registered or eligible for registration in recognised stud book, or the progeny of registered bulls from pure-bred cows.

Valuation.—Maximum of 75 guineas per bull. Maximum advance 150 guineas, or in special circumstances advance to be at the discretion of the Rural Assistance Board.

Advance.—Seventy-five per cent. of landed cost.

Term of Loan.—Maximum five years, interest period one year, redemption period four years.

Security.—Stock mortgage or such other security as may be required by the Rural Assistance Board.

Age of Bulls.—One year to three years.

Health.—T.B. test to be conducted in respect of bulls over two years. C.A. test to be at discretion of Minister.

Stallions.

Qualifications.—Advance to be granted in respect of Clydesdales only, approved by the Stallion Board.

Advance.—Fifty per cent. of cost, and such advance shall not exceed £150.

Term of Loan.—Maximum five years, interest period one year, redemption period four years.

Age of Stallion.—Three to five years, provided in special cases advances may be made for older or younger animals at the discretion of the Board.

Security.—Stock mortgage and insurance. Applications are to be considered on the basis of suitability and requirements of a district.

Group Purchases.—Similar conditions in respect of stallions as defined in respect of the individual are to apply to group purchases, but in which case personal guarantees may be required from the group or the show committee for security.

Boars.

Qualifications.—Advances to operate in respect of Berkshires, Tamworths, Large and Middle Whites, registered or eligible for registration in a recognised herd book.

Advance.—Fifty per cent. of landed cost, such advance not to exceed £7 10s.

Term of Loan.—Maximum two years, interest period six months, redemption period eighteen months.

Age of Pig.—Four months to two years.

Security.—Stock lien or such other security as may be required by the Rural Assistance Board.

An application fee of 5s. will be required in respect of applications under the scheme.

If an applicant should buy a sire, stallion, ram, or boar above the maximum valuation shown, he will be required to defray the excess amount. The Board will advance 50 per cent. or 75 per cent. only on the valuations shown in the foregoing.

THREE-HORSE TACKLE.

The diagram of three-horse tackle is designed to do away with two swingle-trees. A rack is furnished in the middle of the main swingle-tree to alter the leverage, if necessary. The rest of the arrangement is plain to a practical man.

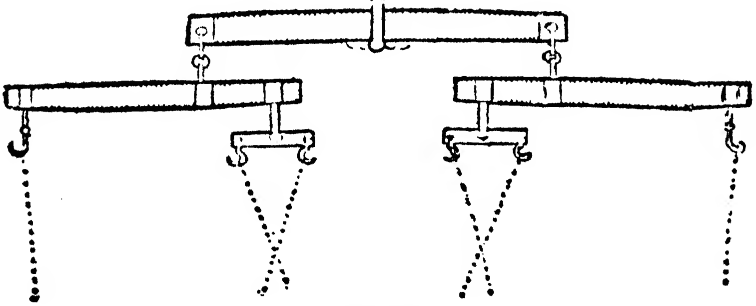


PLATE 75.

Harvesting Cotton.

By R. W. PETERS, Cotton Experimentalist.

THE harvesting of cotton is one of the important operations connected with the production of this crop. Not only is it the most expensive item, the total cost per acre amounting, when good yields are obtained, to as much as £7 sterling on a piece rate per lb. basis, but the way in which the crop is harvested has a decided effect on the quality of the resultant lint produced. Investigations in the United States of America have shown that the fewer cleanings cotton receives during the ginning operations the less damage will be done to the fibres. It has likewise been shown in England that the fewer cleaning operations the fibres have to be subjected to in the spinning processes the better suited they will be for the economical production of yarn of high quality. It can be appreciated, therefore, that the harvesting of a cotton crop should be done carefully, and every factor adversely affecting the quality of the lint should be guarded against.

Picking Cotton.

One of the most important points to observe is not to pick cotton either when it is wet from exposure to rain or when it is green, as fibres are called before the bolls have been open long enough to let the fibres dry out thoroughly.

Not only is it difficult to clean leaf and trash out of cotton in either condition, but during the ginning operations the saws cut the wet fibres very badly, and also tend to leave them in a twisted, ropy state. Lint of this nature is easily detected, and the buyers penalise it heavily, for much waste is obtained from such cotton during the spinning operations. Wet cotton is difficult to gin, and in some types of ginneries it interferes with the delivery of the lint from the saws to the bale press. In the wetter districts of the United States of America it has been found necessary to devise special apparatus to dry the seed cotton before ginning, and the quality of lint obtained from cotton treated in such manner is raised at least a whole grade. In most seasons in Queensland no difficulty should be experienced with wet cotton, for the usual climatic conditions are suitable for the harvesting of dry cotton after the dew has evaporated. Where picking is done while the dew is still present the wet cotton should be spread out in the sun during the forenoon, after which it can be baled with the rest of the picking of the day. It is not necessary to dry the cotton which is picked after the dew is off, providing "green" cotton is not included.

In the earlier years of the present phase of cotton-growing in Queensland, the ginneries were equipped with cleaning apparatus which was not as efficient as that now installed, and it was necessary to pick the cotton rather cleanly in order to obtain high-grade lint from it. As the premiums between grades were then fairly large most growers endeavoured to send in clean cotton, and this tended to slow up the rate of picking. With the present more efficient machinery it is not necessary to have the cotton as nearly "snow-white" as many growers used to send it in order to obtain the best grades. This is particularly true where the farmer and his family pick the crop, and it is suggested in

such cases that it would be better to pick the cotton slightly less cleanly, and therefore more quickly, for not only could greater tallies be obtained in the time available each day for harevsting the crop, but larger acreages could be grown and still be harvested without employing labour.

In this respect it is pointed out that in a normal season in cotton picked prior to the occurrence of heavy frosts, the bracts and pieces of leaf are fairly tough and pliable, and do not break up into small pieces as happens after they become brittle from the effect of frosts. Early picked cotton can thus contain a fair amount of big leaf and still yield lint of high grade, for the cleaning machinery removes the big leaf without breaking it to any extent. It is a mistake, therefore, either to pick so carefully as to have little leaf or, worse still, to roll the cotton between the hands to break up the large leaf. It is the small pieces of leaf which are difficult to remove, and seed cotton containing fine pieces, or "pepper" leaf, as it is termed, have to be graded lower than cotton with big leaf. This is the reason the grades usually drop off after heavy frosts occur—the dead leaves and bracts are so brittle that they break into small pieces when picked with the cotton, and while the improved cleaning machinery eliminates the major portion of them it is impossible to remove all, hence the necessity of grading the seed cotton lower than if the pieces of leaf were large and not brittle.

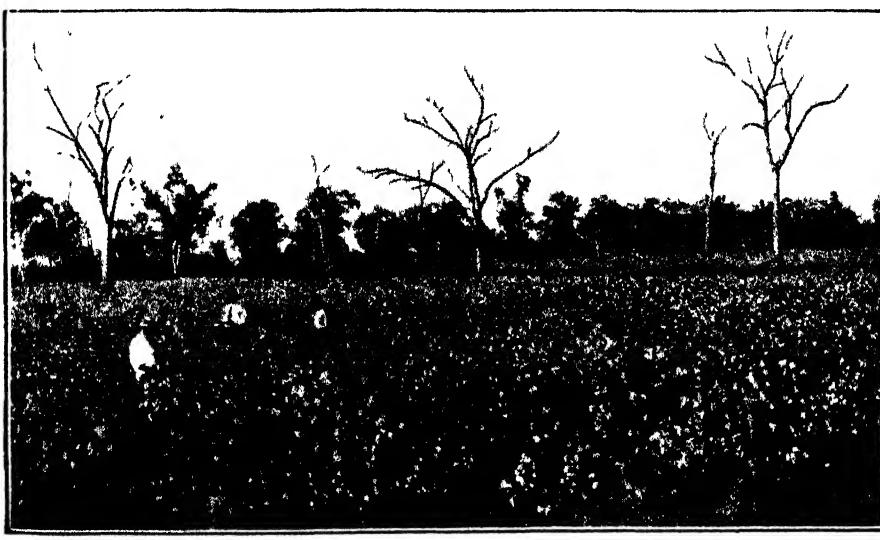


Plate 76.—Cotton Crop Fully Opened.

Cotton in this condition should not be left for any length of time, for exposure to the elements may result in serious damage and general deterioration of the crop.

The most difficult matter to remove from the cotton lint is grass and weed seed, especially spear grass seed, and every effort should be made to clean the fields at the last cultivation so that no seed will be produced. On old cultivations, even where good farming practices have been followed, there is always danger of tall-growing weeds in the rows setting seed late in the season, and it pays to chop out such weeds before the harvesting commences, especially if pickers are employed.

Preserving the " Bloom " of the Crop.

Another important point when harvesting cotton is to guard against leaving the cotton exposed too long to the weather. Cotton, when the bolls first open, has a nice richness of colour, or "bloom," as it is termed, and it is necessary for a sample of cotton to have this "bloom" before it can be graded into the higher grades of the regular universal standards, although it may be free of trash. When cotton is left unpicked for several weeks the bloom is lost through the bleaching action brought about by the nightly wetting of the dews and the subsequent drying by the sun. This changes the colour to a chalky dead-white and also destroys the lustre of the fibres. The effect of storms on cotton is worse than the dews—the colour changes to a dull greyish tinge, and even to a light bluish tinge when rains lasting several days are experienced. When rains do occur cotton should not be picked for several days, for the bleaching action of the dews and sun greatly improves the colour, while wind and heat fluffs out the fibres from the matted condition caused by the rain. This greatly improves the appearance of the lint, and raises both the lint and seed cotton at least a half-grade. The grower thus benefits in two ways by delaying picking after a storm until the cotton has improved in appearance. The cotton is of more value, and no payment is made for picking moisture.

Effect of High Winds.

Another reason for not delaying the picking of cotton too long is the effect of winds on a well-opened crop. With the continuous movement of the plants in windy weather the locks tend to hang out of the bolls in a long, stringy condition. This not only allows the cotton to dry out excessively, thus losing weight and adversely affecting the character of the fibres, but also makes the cotton difficult to gin properly, owing to a considerable proportion of the locks being in a twisted, rope-like condition. Cotton left exposed to windy weather also usually gathers up bits of broken bracts and leaves, especially if severe frosts have occurred. It is difficult to clean such trash in the ginneries, for the smaller pieces are generally twisted in amongst the fibres. In addition to these disadvantages, much greater loss of crop onto the ground occurs in heavy storms in wind-blown cotton than where picking is done at proper intervals. It can be appreciated, therefore, that the opened crop should not be left unpicked too long. Where the harvesting is done by the grower and his family it will pay to make several pickings in a good crop, depending on the season. Where labour is employed it has to be remembered that sufficient bolls must be open to allow the picker to make a reasonable tally, otherwise the cost of picking will necessarily be higher. Generally speaking, it has been found satisfactory when employing labour to make one good picking and then a clean-up in fields of light to medium yield, and two pickings and a clean-up in good crops. The grower should be guided by the conditions as they exist. Sometimes it is better to allow a heavy picking to open and thus get it picked cheaper than if a lighter picking was made, and cotton of a higher quality obtained.

Snapping.

Cleaning machinery is now installed at the Glenmore and Whinstanes ginneries for treating snapped cotton. Snapped cotton is obtained by snapping or jerking the whole burr and contents from the plant, and should be practised only after heavy frosts have been experienced.

The method originated in sections of the United States of America during a season of labour shortage, and the cheaper harvesting costs obtained quickly brought about the general use of the system, especially in places and seasons with high picking rates and early killing frosts. Cleaning machinery was soon evolved to remove the burrs, extra leaf, and parts of the plant gathered in the snapping operations. Undoubtedly the method is of decided value under many conditions, and especially so in Queensland in harvesting the top crop. It is pointed out, however, that snapping should not be substituted for picking cotton that has not been well frosted. Snapping unfrosted bolls tears the plant badly, and the cotton when packed in containers for forwarding to the ginnery "sweats" so that it is difficult to clean and gin. In addition to this, freight is paid for green, wet burrs, leaves, and portions of the plant instead of light, dead material. Snapping mature cotton undoubtedly lowers the grade to the point where the full value of the lint cannot be obtained. On the other hand, snapping the top crop of bolls, which usually contain cotton of the lower grades not only does not lower the grades materially, but enables a considerable amount of cotton to be harvested cheaply which would often not have been picked. Only bolls containing marketable cotton should be snapped, however. During this past season a considerable percentage of dry, hard, diseased bolls, or "hickory nuts," as they have been termed, were forwarded in the late snapped cotton. As these contain no cotton and are removed in the cleaning machinery before the seed cotton is weighed, the grower pays the pickers for nothing of value, and the Cotton Board pays unnecessary freight, thereby reducing the amount of the later payments. Snapping is of value to Queensland cotton growers, but should be used properly.

Packing Cotton.

Owing to the distance of the cotton fields from the ginneries in Queensland the crop is forwarded by train either in bags or wool packs containing around 80 to 100 lb. and 500 lb. of seed cotton, respectively. The growers of small acreages generally use second-hand corn bags, &c., while those with more than 5 or 6 acres usually purchase once-used wool packs for their crop. It is cheaper to use the wool packs, for grower's individual ones are returned for a small fee which covers cost of freight and heating to kill the pink boll worm or any cotton pests in them.

Clean Containers Necessary.

It is pointed out that before filling a container it should be cleaned carefully to remove everything that might affect the grade of the cotton, and wool packs which have had cotton in them should be especially cleaned in order to protect the purity of seed. Growers should pay particular attention to this feature, for undoubtedly much contamination of pure seed varieties can be brought about by the admixture caused through bits of seed cotton sticking in the corners of bales and attached to strands of the sewings along the edges, &c.

Uniformity of Grade in Every Bale.

When packing a container every care should be taken to have only the one grade and staple of cotton in it. A bale of lint is sold on the basis that it contains cotton of uniform grade and staple length. If there is any variation of content encountered it is purchased on the basis of the lowest grade and shortest staple contained. It is necessary,

therefore, for the growers to assist in every way possible in obtaining uniformity of contents of the bale of lint. Where cotton is forwarded in bags the extra sampling done in determining the value of sufficient cotton to make a bale of lint and the better mixing of the small lots, enables uniform bales to be ginned. Very careful mixing has to be done of some wool packs received, however, owing to the layers of cotton of different grades pressed in them. Many large growers have the pickers empty their picking sacks directly into the wool pack, and where this is done layers of markedly different grade often result, owing to some pickers picking trashy cotton. It is recommended that the contents of each bag should be roughly graded by the grower and an endeavour made to segregate the different grades in his cotton into separate wool packs. The grading at the ginneries could then be done more quickly, in that it would not be necessary for the grader to stop and estimate the true value of a wool pack owing to the different grades of seed cotton contained in it as is now frequently done, and in addition more uniform cotton would be fed to the gins, thus enabling the production of bales of lint containing only one grade in each.

It is most important that growers should pay more attention to forwarding containers with uniform contents, and it is strongly recommended that some effort be made to grade the cotton before putting it into wool packs, and blending before putting it into bags. Usually two and in some fields three grades would be ample, for with the exception of droughty spots or places of rank growth, the quality of the crop over a field, if picked in a short time, is more or less the same. By having a bale each for good grade, leafy cotton, and cotton which is insect stained or from droughty spots in the field, a grower, especially with a large acreage, would not only obtain the full value of his crop, but would be forwarding containers of uniform contents, thereby assisting the industry generally.

Forwarding Cotton.

Every grower has a registered number, and should include this with his initials and railway station in a brand for identifying each container he sends. The brand should be placed in a conspicuous place on the side of the container in black that will not rub or wash off. Each season a number of wool packs are received at the ginnery which have no identification marks, or the brands are so indistinct that they are not legible, and it is only through checking up the advice notes which a grower despatches to the Cotton Board when forwarding his cotton, that the ownership can be established. This slows up the work at the ginnery and should not occur, for it is a simple manner to brand the cotton carefully.

Grading.

When the container of seed cotton arrives at the ginnery the contents are examined by a grader, who first determines the grade. "Grade" means a combination of the colour, body, and strength of the cotton and the amount of trash or foreign matter in it. The grades used in grading seed cotton are based on the Universal Standards for American cotton, which are recognised in all official cotton exchanges. The grader then determines the length of the fibres, or staples it, as the operation is termed. Each container is then weighed and check-weighed and checked against the amount of cotton the grower states on his advice note he is sending to the ginnery; after which it is segregated into the proper

stack for ginning according to the grade and staple. When the cotton is being ginned two samples are drawn from each 500-lb. bale of lint in such a way as to represent the true contents. These are labelled and sent to the classing room where another grader grades and staples them under an even light. Each bale is classified against a set of lint standards based on the key set of Universal Standards for American cotton that are obtained from the United States Department of Agriculture every time new reference sets are made. The true contents of each bale of lint are thus known, and also the grade and staple of each container of seed cotton from which the bale of lint was obtained. This enables the grader of the seed cotton to check on his classifications throughout the season and thus ascertain if the seed cotton is producing lint of the quality he has estimated.

The grower can thus see that every care is being taken to prepare his produce so that the full value will be obtained for it. Being graded on the accepted Universal Standards it can be readily sold in any cotton consuming country. As acclimatized seed of suitable varieties is supplied through a scheme of seed development controlled by the Department of Agriculture and Stock, the grower has the means of producing cotton of high quality, and it has been thoroughly demonstrated that where proper cultural systems are carefully followed the Queensland cotton grower can produce an article which is satisfactory in all respects.

PIPE WRENCH.

When a large pipe wrench is needed, but not available, one can be quickly improvised by using a small wrench in connection with a chain, as illustrated. The

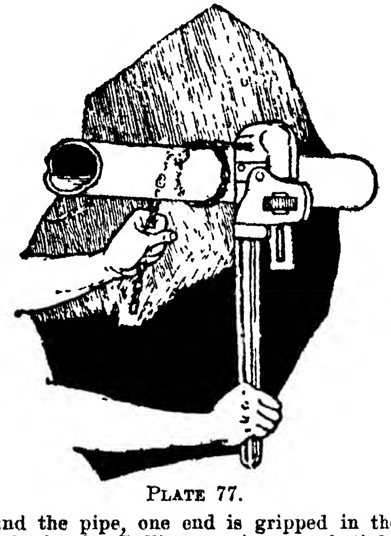


PLATE 77.

chain is wrapped around the pipe, one end is gripped in the jaws of the wrench, and the other held in the hand. Pulling on the wrench tightens the chain so that the pipe can be turned.

Pasture Requirements and Composition.

By E. H. GURNEY, Agricultural Chemist.*

THE wealth of the Australian Commonwealth is largely derived from primary products, and particularly is this the case in the State of Queensland. These primary products are dependent on pasture growth; in fact it has been stated that more than three-quarters of the monetary value of Queensland's exports is derived from glasslands.

From this it will be seen how important it is that all information obtainable regarding pastures should be utilised in order that greater production of all primary products be attained, and that at the lowest cost.

That extensive research work is required in connection with the pastures of Queensland is well known, but mention should be made that information of economic value regarding some of these pastures has been obtained and widely published and that, although some have made use of such information in their pasture management, many owners of similar pasture have not. This matter will be referred to later.

That some attention was paid to pasture in early times will be seen from the following interesting extract taken from an article—"The History of Pasture Analysis," by William Davies[1] :—

> "Worlidge[2] in his "Systema Agriculturæ: the Mystery of husbandry" (1687), considers at some length the management of pastures and refers to the sowing of ray grass (= perennial rye grass), St. Foyn (Sainfoin), and la lucerne (= lucerne) for the purpose of providing hay and fodder. He makes no reference whatever to specific examination of the resultant herbage crop. Similarly, Marshall[3] (1788), refers to methods for improving grasslands, but makes no suggestion relative to herbage analysis. Sinclair[4] (1824), provides valuable information regarding the leading grassland outlook of his day. His own work, together with that carried out in collaboration with Sir Humphry Davy, lays the foundation for combined agronomic and chemical studies on individual British grasses and clovers."

From this it is seen that pasture has been studied from early times, but from about the beginning of this century what may be termed a special detailed pasture investigational period has occurred, and that such pasture study has been world-wide, covering humid to arid climatic conditions.

During the later period mentioned there have been, no doubt, a number of reasons for the particular interest taken in grass study, but the main reasons, it is considered, have been the importance of making practical use of the fact that great variation in composition of grass occurs at different stages of growth, and that when the feed-value of grass is being considered the amount and composition of its mineral content has also to be taken into very definite account.

* In a radio lecturette from Station 4QG.

Before describing the variation in composition of some of our grasses, brief mention may be made of the functions of some of the food ingredients—e.g., proteins, fibre, and mineral matter—contained in grasses and other feeding stuffs.

Proteins are complex nitrogenous bodies existing in grasses and foodstuffs, and are used by animals for building up the proteins contained in the muscle, flesh, and blood of their bodies. For the purpose of making flesh, &c., the young growing animal will require a relatively large amount of protein in its feed, whilst the mature animal requires the protein for repairing waste in the body, and particularly is an extra supply of protein required by an animal producing milk.

Some quantity of fibre in foodstuffs is useful in giving bulk to the food and in aiding to a certain extent digestion. Different animals require different amounts of fibre in their rations. The digestion and evacuation of fibre necessitates the use of some energy by the animal; therefore the extent to which fibre in any foodstuff is digestible is of importance.

Mineral matter is required by the animal for bone formation, in maintaining the normal condition of blood and other body fluids, and particularly in mineral matter required by animals producing milk.

The more recent work upon grass and grassland has shown that malnutrition of stock is caused, in many cases, by insufficient or improperly balanced mineral matter in the grass feed, and that even when distinct evidence of malnutrition is not apparent that low production or ill-health may be caused by some mineral deficiency.

A few examples showing the difference in composition of plants at different stages of their growth will now be given, but it must be understood distinctly that all the figures quoted are calculated upon the analyses of "water-free material" contained in the plants.

	Water-free Material.				Remarks.
	Crude Protein.	Crude Fibre.	Lime.	Phosphoric Acid.	
Paspalum ..	20·6	23 7	·41	·61	Short young grass
Ditto ..	5·7	35·2	·54	·33	Old stemmy growth
Rhodes grass ..	16·4	27·1	1·19	·72	Young leafy grass
Ditto ..	5·8	33·3	·58	·60	Old stemmy growth
Mitchell grass ..	17·1	30·9	1·0	·53	Young
Ditto ..	8·76	39·7	·56	·49	Midgrowth
Ditto ..	4·02	43·4	·46	·24	Mature
White clover ..	29·9	16·9	1·56	1·18	Young leafy growth
Ditto ..	18·1	22·1	2·07	·52	Old growth
Lucerne ..	29·4	17·0	1·97	1·01	Young preflowering growth
Ditto ..	18·4	32·6	3·54	·67	Old mature growth
Phalaris tuberosa	25·9	19·6	·50	·34	Short young grass
Ditto ..	10·8	27·7	·81	1·13	

These figures are not the extreme limits of variation in composition that may occur in plant growth, for in the very young growth of a number of forage plants a protein content of 33 per cent. and more occurs, whereas, on the other hand, in old matured growth, such as

grass roughage, the crude protein content may be about 1 per cent., together with less than on-tenth of 1 per cent. of phosphoric acid.

That young pasture growth has a very high feed value and is in a digestible condition has been stated in many publications, but it is considered that this fact has not had the practical recognition in Queensland that its value deserves.

In our climate, owing to most of the seasonal rain falling during the warmer months of the year, a very prolific and rapid growth of grass ocurs. A very large proportion of this flush growth in the younger and highly nutritious stage is not consumed by stock, but continues to grow to maturity and ultimately becomes roughage of more or less low feed value. Thus it is that a large amount of highly nutritious foodstuff is not made use of, and it is important that serious consideration should be given by all stock owners to methods for the economical use of such valuable foodstuff. Suitable methods for the utilisation of young paspalum growth have been established and put into practical use with success by at least some owners of dairy stock in Queensland.

It has been demonstrated that after mowing and removal of roughage followed by treatment with suitable "renovators" even old established paspalum pasture will give heavy yields of fresh young growth when fertilized with 1 cwt. of ammonium sulphate and 2 cwt. of superphosphate per acre. This young growth may be utilised by a system of "rotational grazing," or by repeated mowings harvested, and conserved as hay or ensilage.

The fertilizing of grass and feeding-off in the young stages of growth is of particular value when the soil is deficient in phosphoric acid, and a large number of our coastal soils have a poor phosphoric acid content The fertilizing of these pastures also induces increased clover growth which, as mentioned before, when young has a very high lime and phosphoric acid content.

The best results from all grass varieties may not be obtained by a method of repeated mowings or intensive grazing. Experiments with Rhodes grass dealing with this matter are being conducted.

In the case of Mitchell and Flinders grass, the making of hay with these grasses, when not too matured, would appear to be the most suitable method for the conservation of a certain amount of flush growth. Very fine samples of sweet smelling Mitchell and Flinders grass hays have been analysed and found to contain relatively high amounts of protein and low fibre.

From what has been said it is apparent that young grass growth is material of high feed value, and as it is produced upon the farm or holding it is cheaper than bought foodstuff of equal food value, and failure to make the most use of it means loss of profit.

Mention has not been made in connection with some different methods of pasture improvement, such as the introduction of the best grass strains and legumes into some of our grasslands, but it is generally recognised that such improvements would be of very great economic value.

Reference has mostly been made to the high food value of young grass growth, but it is considered that some stock owners place too much reliance upon the feeding value of old matured grass. It should

be fully recognised that this dependence upon old grass will result in lower production by all kinds of stock, particularly in the case of introduced high-grade stock, and in many cases through malnutrition will cause the stock to become liable to disease.

REFERENCES.

1. William Davies, "The History of Pasture Analysis," from "Agricultural Progress," Vol. X., 1933.

2. J. Worlidge, "Systema Agriculturæ; The Mystery of Husbandry."

3. Wm. Marshall, "The Rural Economy of Yorkshire."

4. G. Sinclair, "Hortus Gramineus Woburnensis."

QUEENSLAND SHOW DATES, 1934.

March.

Allora, 7th and 8th
Clifton, 14th and 15th
Millmerran, 20th
Tara, 21st
Goombungee, 28th
Boonah Camp Draft, 31st March and 2nd April

April.

Pittsworth, 4th and 5th
Warwick, 10th to 12th
Toowoomba, 16th to 19th
Rosewood Camp Draft, 7th
Goondiwindi, 27th and 28th
Oakey, 28th
Taroom Camp Draft, 30th

May.

Taroom, 1st and 2nd (Camp Draft, 5th)
Dalby, 3rd and 4th
Beaudesert, 2nd and 3rd
Nanango, 3rd and 4th
Blackall, 7th to 9th
Chinchilla, 8th and 9th
Charleville, 8th to 10th
Crow's Nest, 9th and 10th
Boonah, 9th and 10th
Monto, 9th and 10th
Kingaroy, 10th and 11th
Ipswich, 15th to 18th
Miles, 16th
Kilkivan, 16th and 17th
Mitchell, 16th and 17th
Mundubbera, 16th and 17th
Dirranbandi, 16th and 17th
Wondai, 17th and 18th
Roma, 22nd to 24th
Gympie, 23rd and 24th
Emerald, 23rd and 24th
Biggenden, 24th and 25th
Murgon, 24th to 26th
Toogoolawah, 25th and 26th
Kalbar, 26th
Goomeri, 29th and 30th

June.

Maryborough, 1st, 2nd, and 4th
Marburg, 1st and 2nd
Childers, 5th and 6th
Gin Gin, 5th and 6th
Bundaberg, 7th to 9th
Lowood, 8th and 9th
Bororen and Miriam Vale, 11th and 12th
Wowan, 14th and 15th
Rockhampton, 19th to 23rd
Mackay, 26th to 28th
Laidley, 27th and 28th
Proserpine, 29th and 30th
Townsville Rodeo, 30th

July.

Bowen, 4th and 5th
Gatton, 4th and 5th
Kilcoy, 5th and 6th
Ayr, 6th and 7th
Townsville, 10th to 12th
Woodford, 12th and 13th
Rosewood, 13th and 14th
Cleveland, 13th and 14th
Cairns, 17th to 19th
Charters Towers, 18th and 19th
Caboolture, 20th
Nambour, 18th and 19th
Atherton, 24th and 25th
Pine Rivers, 27th and 28th

August.

Royal National, 6th to 11th
Home Hill, 31st August and 1st September

September.

Enoggera, 1st
Imbil, 7th and 8th
Ingham, 7th and 8th
Innisfail, 14th and 15th
Beenleigh, 20th and 21st
Mareeba, 20th and 21st
Rocklea, 22nd
Malanda, 26th and 27th
Kenilworth, 29th

October.

Millaa Millaa, 5th and 6th
Tully, 12th and 13th

The Pig Farm.

ACCOMMODATION AND EQUIPMENT.

By L. A. DOWNEY, H.D.A., Instructor in Pig Raising.

The lively interest taken in progressive pig raising in Queensland in recent years has led to an increased demand for information on the layout and equipment of modern piggeries. Articles on the subject have been published in this Journal from time to time, the last one appearing in our issue for August, 1932. This paper, besides being a revision of former articles by the same author, contains much new material, including plans of pens and a portable shelter prepared by the Public Works Department from sketches supplied by the Pig Branch, and which should be very useful to farmers contemplating improvement of their piggery accommodation, as well as to others about to enter the pig-raising industry.—ED

ALTHOUGH the pig is a fairly hardy animal it is, in these days, more than a scavenger, it is a pork-producing machine which is kept by the farmer to convert certain foods into edible pork, the farmer's object being to have his pork-producing machine working at the highest degree of efficiency—that is, he wants to have his pigs growing rapidly on the least amount of food and producing good quality meat. Of course, breeding and feeding are two important factors in pork production, but accommodation and management are equally important; the pork machine cannot function efficiently unless it is well cared for. In our comparatively mild climate there is no need for elaborate housing for pigs, as is the case in some colder climates, but still the pig should be provided with sufficient shelter from the extremes of the weather.

Where pigs are kept as a side line on the farm, their accommodation is sometimes very neglected, but there is no good excuse for this, for even when there is little money available for building the piggery, it can still be built along proper lines provided a little thought is given to the planning of the yards, sheds, and paddocks; if not well planned but just allowed to grow, the piggery will become a muddle. The old idea that the piggery was a dirty and objectionable place has now disappeared and the pig is given his rightful place on the farm either in a nice grassy run or in a well-kept concrete pen.

Speaking in a broad way, it may be said that there are only two satisfactory methods of keeping pigs, one is on pasture, and the other is in concrete pens, anything between these two systems such as a bare earth sty or yard is unhygienic and therefore unsatisfactory. Every pig raiser should decide whether his conditions are most adapted to paddockings pigs or penning them on the intensive system.

The grazing of pigs either on permanent pasture paddocks which can be grazed and spelled in rotation, or on crop paddocks where a succession of forage crops can be provided and the soil cultivated periodically, has many advantages—the pig lives in a natural condition and is contented, it has a healthy atmosphere and abundant sunlight which tends to promote health in the animal. If the grazing is good, the

pigs will obtain a portion of their food and may be encouraged to do their own harvesting, thus saving labour. When pigs are grazing there is little risk of them suffering from mineral or vitamin deficiency. Rotational grazing and cultivation of pig paddocks is one of the most practical means of controlling worm infection in pigs which threatens to become a serious problem in pig production. The present requirements

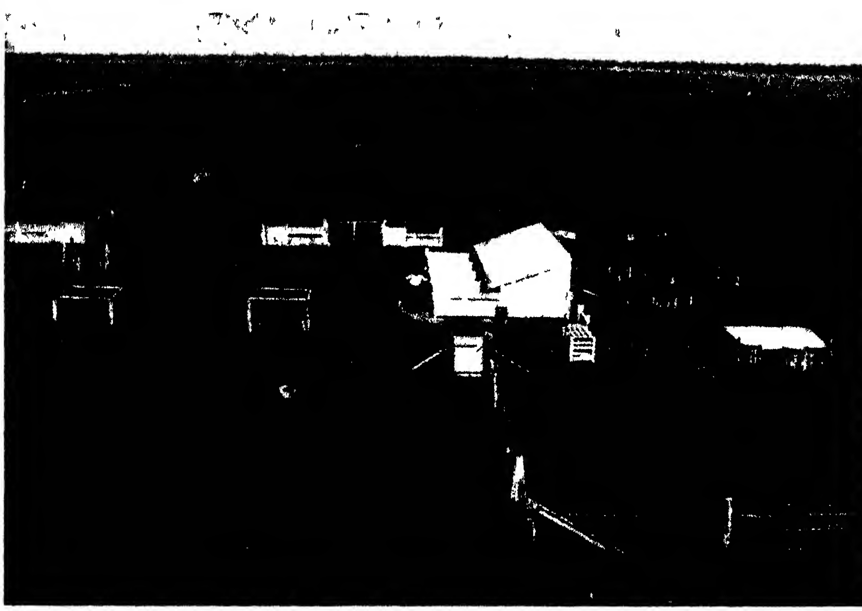


PLATE 78.
A well-planned piggery at Dalby with intensive pens and a number of grazing paddocks provided with Pepperina trees for shade.

of the pork and bacon trade are for lean meat, and it is easier to produce lean, fleshy porkers and baconers if they are grazed than if they are confined in small pens. Most agricultural and dairy farm piggeries can be conveniently laid out for paddocking pigs, and the best plan is to have three or more small paddocks of half an acre or more each which can be ploughed at any time.

Some pig farms, such as buttermilk piggeries, slaughter-yard piggeries, and suburban pig farms, are not suited for grazing pigs, and so in such places the intensive system of housing is recommended. On these places large numbers of pigs are kept on comparatively small areas and for sanitation it is necessary that they should have impervious floors such as concrete with a wooden section to camp on.

After having decided on the class of pig accommodation to suit the particular conditions, the farmer should survey the extent to which the pig section of the farm may grow, and then plan the whole undertaking on a definite system. He should estimate the number of breeding sows he is likely to run, and the room required to accommodate them and their progeny up to porker or baconer stage.

The amount of land required for grazing pigs will naturally depend on the climate, the class of land, whether it is cropped with heavy-yielding

crops or grassed, and the nature and amounts of other foods available for the pigs. Pig pasture paddocks should be rested from the pigs or cultivated when they begin to get bare, so they should be sufficiently subdivided to allow of rotational grazing. In subdividing pig paddocks, it is an advantage to make the runs long and narrow so that by the use of a short length of temporary fencing a portion of the paddock can be partitioned off for the stock to graze on, and when this is cleaned up the temporary fence may be moved to give the pigs a fresh piece of the crop.

Adjoining the pig paddocks there should be a lane leading to a loading race to provide for convenient loading of the pigs.

PLATE 79

Pigs give best results when run on good pasture.

Where pigs are grazed in paddocks, movable equipment such as sheds and troughs will be found most convenient in all but very hilly country. The sheds and troughs may be built on skids for easy transport by a horse team or tractor The advantages of movable equipment over stationary sheds and troughs are that, when pigs are being concentrated in one particular paddock to feed off a crop, sufficient sheds and troughs may be easily taken with them; also when the ground around the troughs and sheds becomes fouled, as it does after a time, they may be shifted and the ground allowed to sweeten. Where permanent troughs are built in pig paddocks they should be made of concrete and be built into a concrete floor which can be drained and kept clean.

When given a good paddock and plenty of food pigs do not as a rule try to break through fences, and it is a rule that the larger the paddock the lower and less substantial the fence required to keep the pigs in. The many types of woven wires and barbed wire make good pig paddock fences. If there is any natural shade in the runs the pigs will only require the shelter of the sheds in extreme weather, and therefore the sheds need not be elaborate or expensive.

The size of the sheds or huts required in the paddocks will depend on the number and class of pigs it is desired to house, but a useful size is 8 feet by 8 feet floor space and the roof should be about 6 feet from the floor so that a man can easily work inside the shed and so that the pigs may keep cool in them on a hot day. With a floor 8 feet by 8 feet there is ample room for a sow and litter or for about ten growing pigs. The class of material to be used in the construction of the sheds will depend on their availability and cost. The floor should be set on two strong skids, which not only keep the floor boards dry, but also provide for easy transport of the shed.

For intensive housing of pigs the camping shed can be built the same as the shelter shed for paddocked pigs, but there should be a small run adjoining which has a sloping concrete floor and a good drain; a reliable water supply should be provided at such piggeries so that the pens may be washed and kept in a sanitary condition. The troughs in the intensive pens may be movable or they can be of concrete built into the floor. Where practicable the pigs sheds should be so placed that the early morning sun rays will penetrate right inside as the sun is a good and cheap disinfectant. The front of the shed should be at least partly open to allow the sun rays entrance.

Legislation.

Pig raising is controlled by legislation under the Pig Industry Act, Dairy Produce Act, Diseases in Stock Act, and the Slaughtering Act, and the by-laws of city, municipal, and shire councils. While it is advisable when about to construct or alter a piggery, to consult the authorities concerned, through the district inspectors under the Acts, it might be stated here that the general purposes of the legislation in force are to provide for health and sanitation on the premises where pigs are kept. They do not aim at hindering progress or at increasing the cost of production.

Situation.

In selecting a site for the piggery, consideration should be given to the aspect so as to provide shelter from the prevailing winds, and to make the best use of the early morning sun as a disinfectant and deodoriser inside the sheds; thus a north-easterly aspect will usually be found the most suitable for pig accommodation.

It is an advantage to have the pig paddocks on a slope to provide surface drainage. It is required by the Dairy Produce Act that the piggery should be situated at least 150 feet from dairy yards and buildings. Where separated milk is to be used for pig feeding, the farmer should endeavour to have the piggery and dairy so situated that the separated milk may be conveyed in a line of open fluming from the separator-room to the piggery so as to save unnecessary labour which would otherwise be involved in carrying or wheeling the milk to the pigs.

The available water supply, shade, and proximity to cultivation land are other points to be considered.

A Suggested Layout.

The plan of a piggery shown in Plate 80 suggests a layout which has proved very satisfactory where suitable cultivation or grazing land is available. This plan gives scope for cultivation and rotational grazing

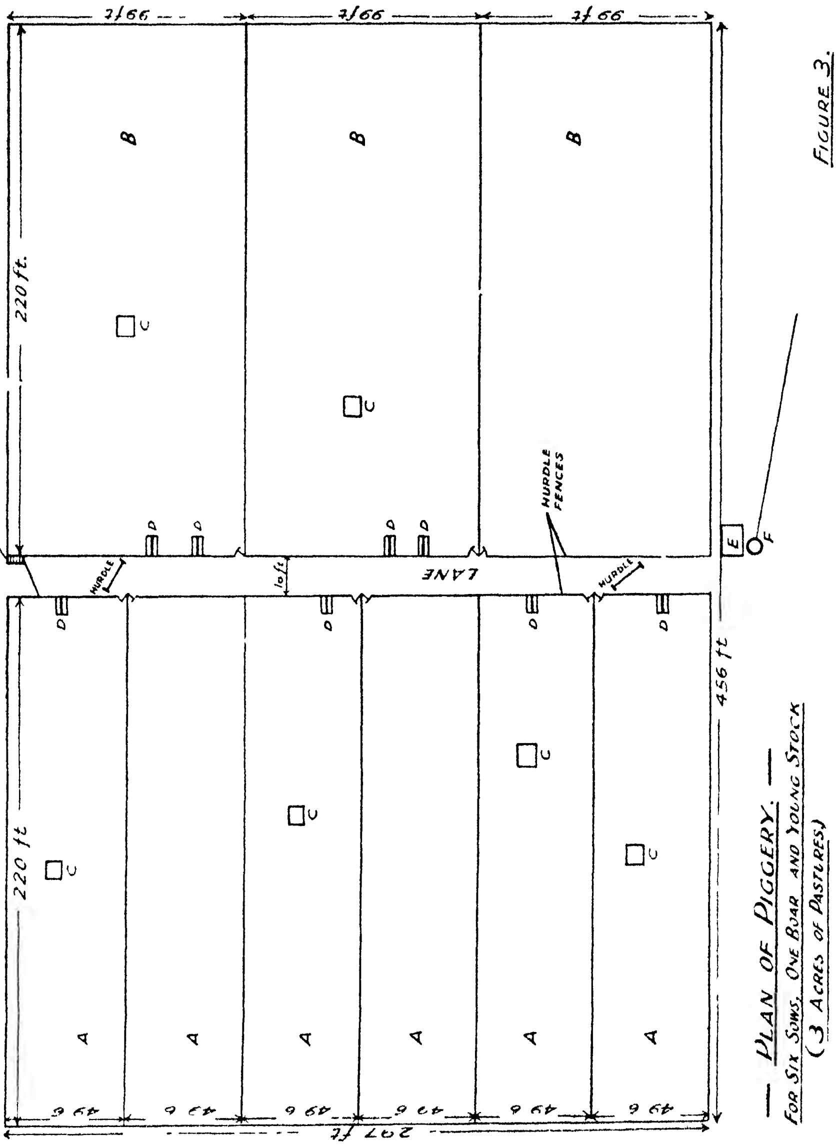


PLATE 80.

(*a*) Indicates paddocks of ¼ acre each for the use of dry sows, sows with litters, and the boar. At most times two of these paddocks could be under cultivation and later be grazed in rotation.

(*b*) Indicates paddocks of ½ acre each in extent to be used for growing pigs. As one paddock could usually be spared they can be cultivated and grazed in rotation.

Six movable sheds (*c*) should be sufficient shelter for the pigs, as these may be moved from one paddock to another as required.

Troughs built on movable platforms (*d*) will be found convenient if drawn against the fence and moved along as the surrounding ground becomes fouled.

(*e*) Shows the feed shed.

(*f*) Shows the milk tank connected by a line of fluming from the separator-room.

of paddocks with a view to providing a maximum of pasture for the pigs and control of disease and parasites. The lane in the centre of the runs with a loading race at one end and two movable hurdles provides ample facilities for drafting pigs.

The usual fencing should be replaced by movable hurdles at the ends of the runs adjoining the lane so that when paddocks are being cultivated implements may work right to the end of each run, for it is this portion around the troughs which becomes most fouled.

All sheds and troughs should be constructed on skids so that they may be moved when required to keep the runs in a sanitary condition.

It is not suggested that pigs will obtain all their food from the three acres of grazing shown in this plan, and the grazing can only be expected to carry the pigs if other foods such as grain and milk or grain and meatmeal are provided in addition.

Where the correct type of pig is bred and feeding conditions are good, pigs may be kept in paddocks, as suggested, from birth to slaughter with excellent results.

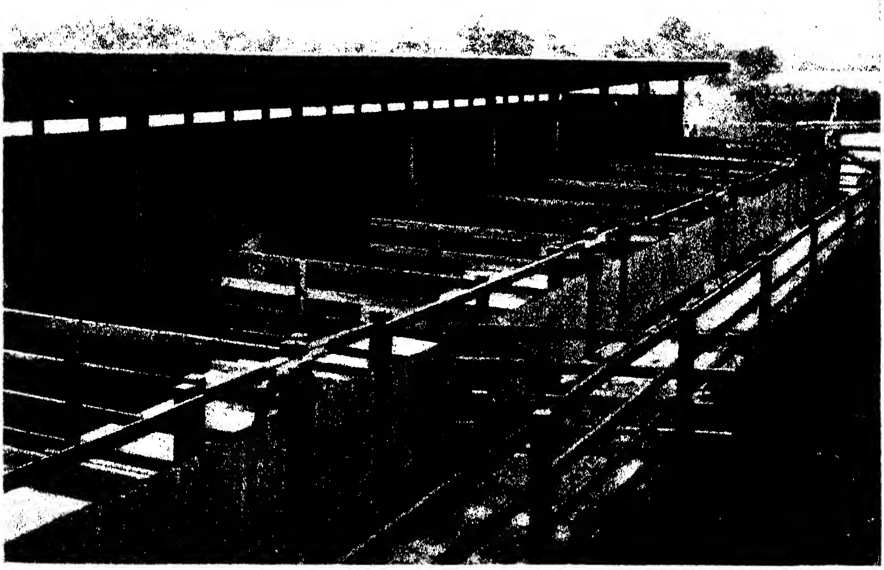


Plate 81.

Intensive pig pens in use at the Animal Health Station, Yeerongpilly.

Quarantine Pen.

It is advisable to provide a quarantine pen some distance from other pens, where newly-introduced pigs and sick pigs could be placed and kept under observation. This is an important safeguard against disease.

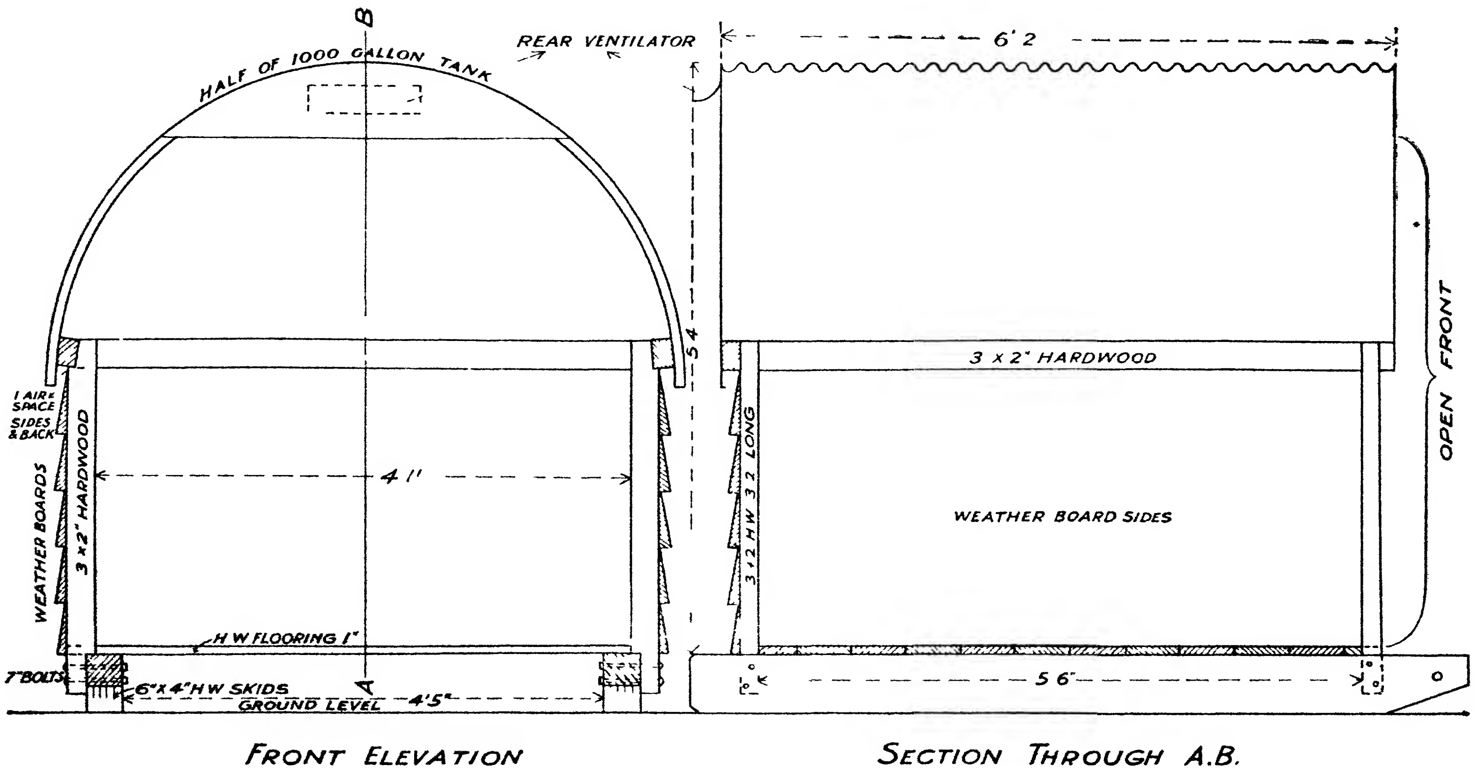


PLATE 82

Plan of a portable shelter shed, using half a water tank. Note skids on which this shed is constructed, providing for ready means of moving the house when required.

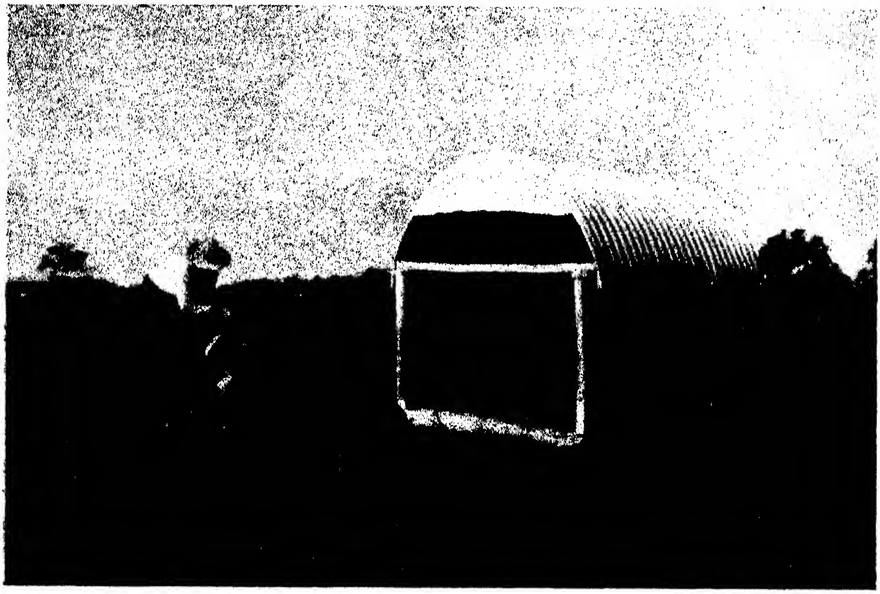


Plate 83.
A half-tank shed in use at the St. Lucia Training Farm.

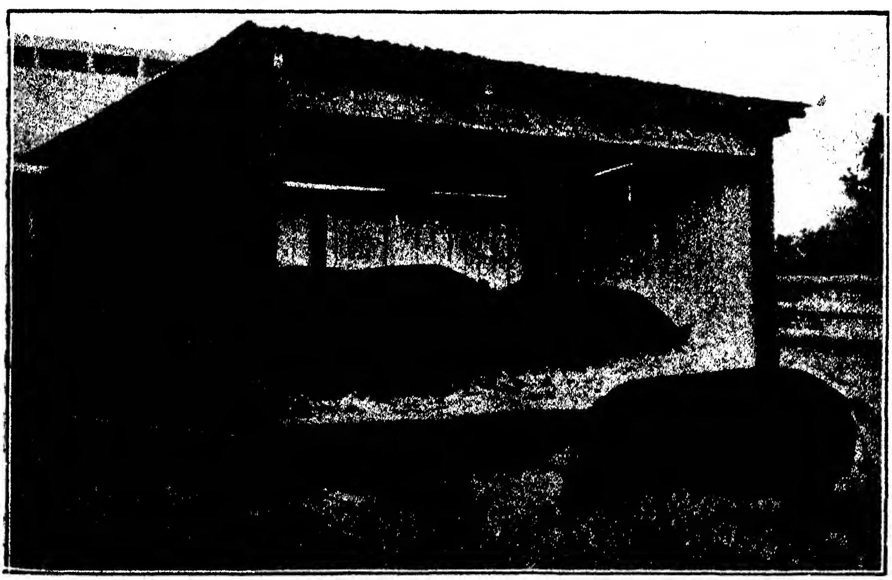


Plate 84.
An open-fronted shelter shed for use where the movable shed is not practicable.

Guard Rail.

All farrowing houses should be fitted with a guard rail to prevent young pigs from being crushed against the walls. Experience has proved that the use of this rail has saved an appreciable percentage of young pigs. This rail can be constructed of 3-inch by 2-inch hardwood, 1-inch water piping, or saplings. It should be placed 9 inches above the floor and 7 inches from the walls.

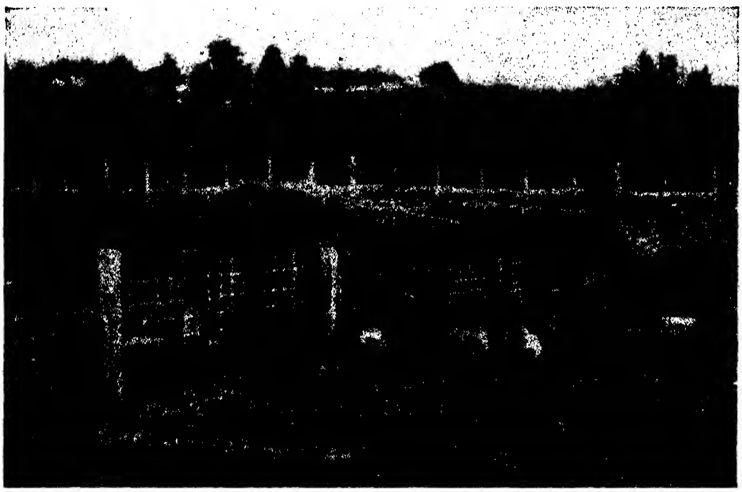


PLATE 85.
Woven wire pig fencing. Note the shade provided.

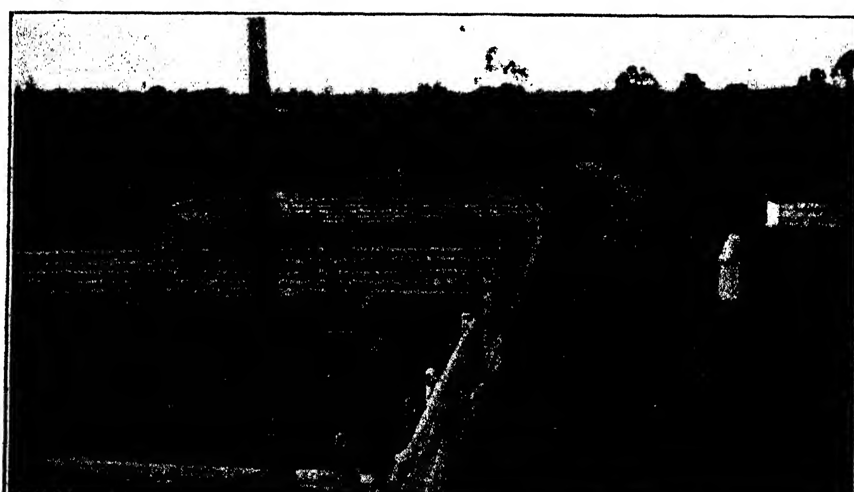


PLATE 86.
Straight saplings may be put to good use in pig fencing.

Fences.

The class of fence to be used on each farm will be governed mainly by the available material for its construction.

Pig fences need to be from 2 feet 6 inches to 4 feet in height, depending on the class of pigs to be enclosed. Large boars and sows sometimes have a tendency to jump fences, and for such animals a

Plate 87.
Another durable pig fence.

4 feet fence would be necessary; however, a fence 3 feet high is usually sufficient to control pigs of all sizes, while young pigs are usually kept in their places by 2-feet 6-inch fences. To overcome this difference in the required heights of fences, posts should be 4 feet out of the ground so that the height of the fence may be raised to 4 feet, if necessary, by the use of extra barbed wires.

With pig pens, it is a fairly constant rule that the smaller the pen the more substantial the fences must be; the reverse also holds. It is usually advisable to have a line of barbed wire, either on the ground level or a few inches below, to prevent pigs from rooting under fences; logs or stones can sometimes be used for the same purpose.

Where wire fences are used it is advisable to either reinforce them or replace them by wood at the feeding end of the paddocks, as there is most wear and tear on this part of the fence.

Troughs.

The piggery should be equipped with troughs of sufficient capacity to feed the pigs without undue scrambling or fighting at feeding time. An average space of 10 inches should be allowed for each adult pig. The trough should have the capacity to hold a full feed for the pigs.

Pig troughs should be strongly constructed and have a smooth surface free from corners or cracks. Where portable troughs are made they should be of a size which allows of their being easily carried on to clean ground. With stationary troughs it is essential that they should be built on to a floor of concrete, brick, or timber to prevent the pigs from making an objectionable mud wallow beside the trough. Wooden slabs placed on the ground beside the feeding trough are very insanitary, even if they do keep the pigs out of the mud.

The most serviceable troughs are of concrete built into a concrete floor as shown in Plates 88 and 90.

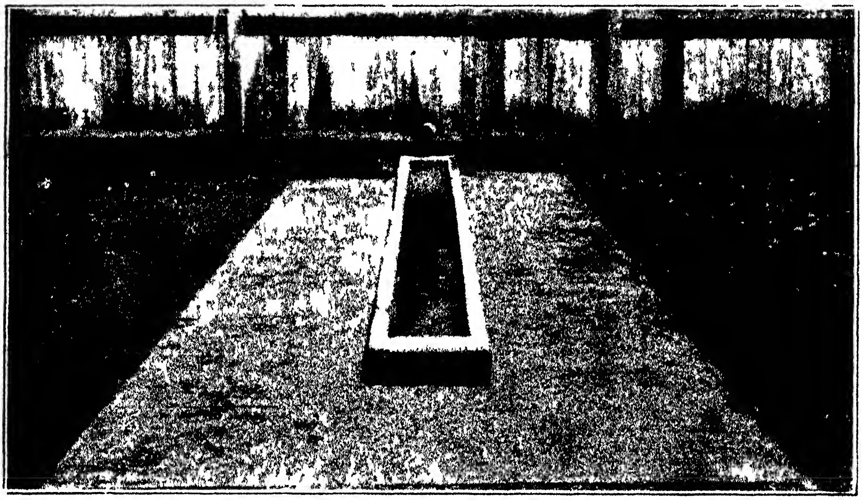


PLATE 88.
Concrete food trough and platform

PLATE 89.
Handy V-shaped wooden troughs.

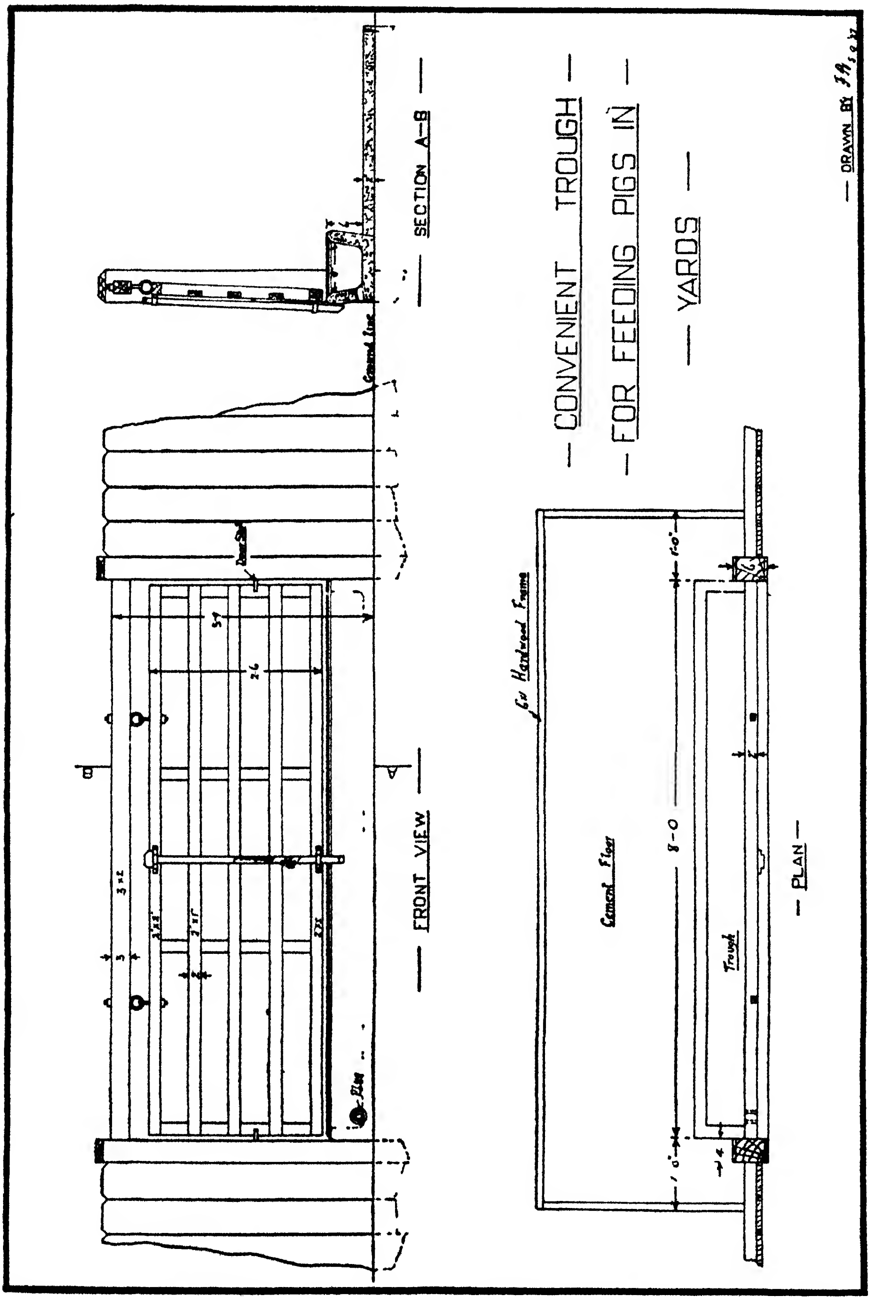


Plate 90

The trough illustrated in Plate 88 is 14 feet in length, and the width is 15 inches overall, having its sides of 2½-inch thickness, reinforced with barbed wire, lengthways. The trough is 5 inches deep and the inside width is 10 inches. The platform is 7 feet wide and 16 feet long

and 4 inches in thickness, and is surrounded by a protective flange 4 by 2 inch hardwood, bolted together at the corners to protect the edges of the platform from being broken away.

Improvements could be made to such a trough by having a bung in the end leading outside the pen to facilitate cleaning the trough. Also, if the end of the trough projected outside the fence, food could be poured in from the outside. Iron bars of ½-inch thickness set into the concrete across the trough 10 inches apart prevent the pigs from fighting at the trough, and also prevent pigs from rooting food out of the trough. In such a trough it is preferable to have all the corners rounded off in order to facilitate cleaning.

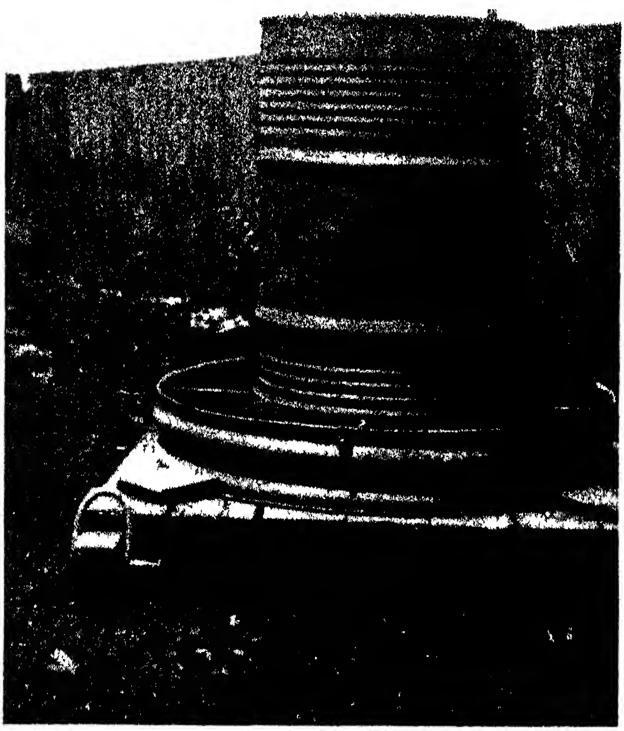


PLATE 91.
Automatic water fountain suitable for pigs in paddocks.

The V-shaped wooden trough, as illustrated in Plate 89, is very useful as a movable trough. This type of trough can be made of varying sizes to suit requirements. The timber must be sawn and tightly fitted to prevent leakages. A dressing of tar inside and out acts as a preservative of the wood, and also makes it watertight and more hygienic. Such a trough, built on a movable wooden platform, is most convenient for paddock use.

Cast and galvanised iron troughs of various designs are procurable from hardware stores, and these are satisfactory under certain conditions.

Automatic Waterer.

Plate 91 illustrates a watering device used at the Kairi State Farm piggery. A 40-gallon drum is set into a trough 6 inches deep and the whole is fixed on to a slide. The drum has a ½-inch plug hole 1½ inches from its bottom, and a larger plug hole for filling at its top. The lower hole allows the water to flow out to a sufficient height for the pigs to drink from the trough, and to fill the drum, the bottom hole is plugged and the top hole opened.

Self-feeders.

Self-feeding of pigs is as yet little practised in Australia, mainly because pigs are kept chiefly to utilise by-products, such as separated milk, which are not readily adaptable to self-feeding; but when the price ratio of grain and pork is such as to make the pig a profitable means of disposing of grain, pig raising must be considered from a somewhat different viewpoint.

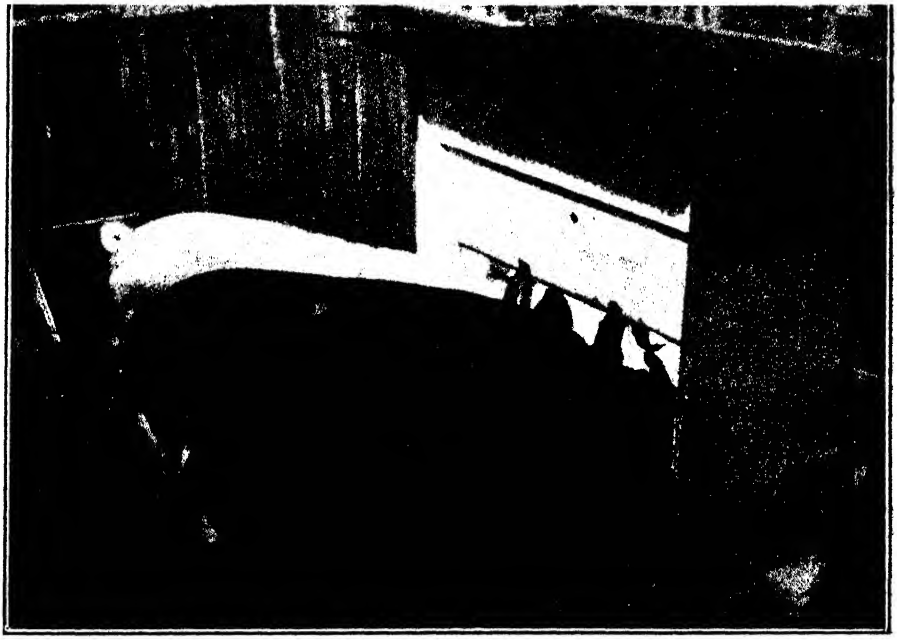


Plate 92.

Baconers grown on the self-feeder in which was placed a mixture containing 80 lb. maize meal, 10 lb. lucerne chaff, and 10 lb. meatmeal. The pigs were also given unlimited supplies of water to drink.

The grain grower who keeps pigs, but has no milk foods, can make good use of his grain by feeding it in combination with such feeds as lucerne chaff and meatmeal, both of which are substitutes for separated milk in the pig's ration. Such feeds as these are adaptable to dry feeding through a self-feeder whereby the pigs have several days' food supply placed in the feeder and they are allowed to help themselves.

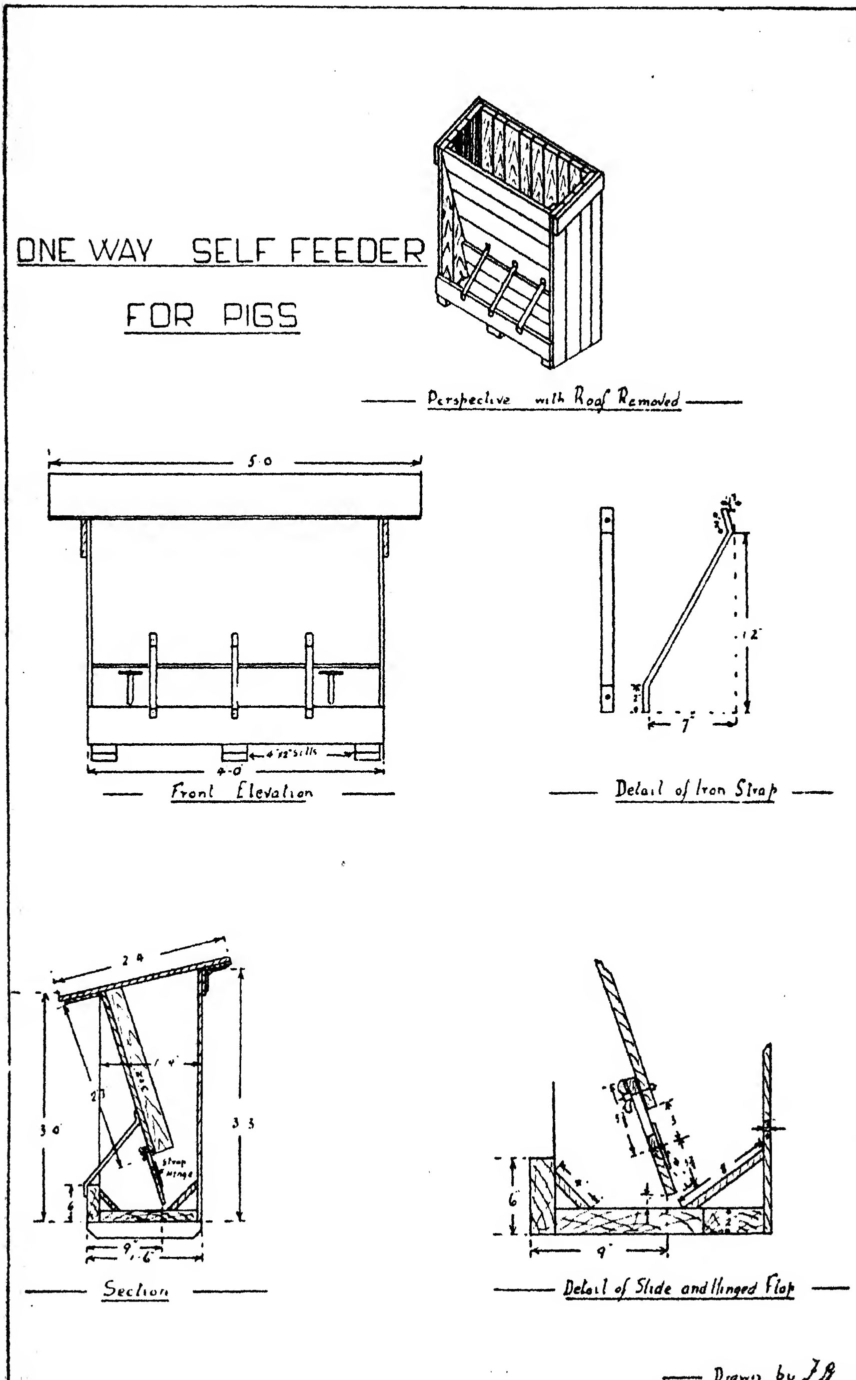

ONE WAY SELF FEEDER
FOR PIGS
Perspective with Roof Removed
5·0
4"x2" sills
4-0
Front Elevation
12"
7"
Detail of Iron Strap
2 4
1 4
3 0
3 3
Strap Hinge
9"
Section
6"
9"
Detail of Slide and Hinged Flap
Drawn by

PLATE 93.

Under certain conditions self-feeding has many advantages and is worthy of further trial.

Plates 92 and 93 illustrate a type of self-feeder which has given satisfactory results in practice.

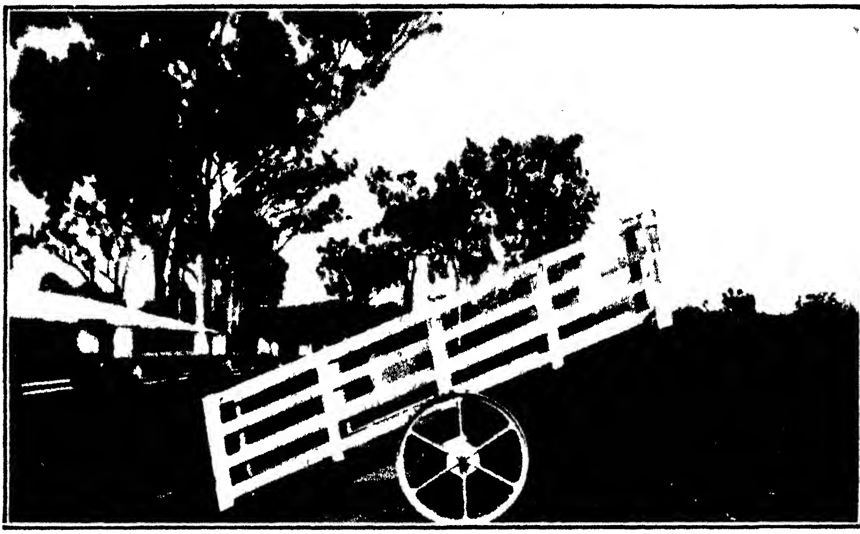


PLATE 94.
A useful portable loading race.

ONE WAY SELF FEEDERS FOR PIGS—MATERIAL REQUIRED.

Members	Number	Length Ft In	Size	Material
Skids	Three	1 6	4 in x 2 in	Hardwood
Trough	One	4 0	6 in x 2 in	Pine
Trough	One	3 10½	12 in x 2 in	Pine
Trough	One	3 10½	4 in x 2 in	Pine
Trough	One	3 10½	8 in x ¾ in	Pine
Trough	One	3 10½	4 in x ¾ in	Pine
Front panels	Five	3 10½	6 in x ¾ in T & G	Pine
Front panels	Two	2 3	3 in x 2 in	Pine
Sliding and hinged flaps	Two	3 10½	4 in x ¾ in	Pine
Ends and back	Twenty four	3 3	6 in x ¾ in T & G.	Pine
Ends and back	One	7 0	6 in x ¾ in	Pine
Top	Ten	2 4	6 in x ¾ in T & G	Pine
Top	Two	5 0	6 in x ¾ in	Pine

Hardware—Three 1-inch by ¼-inch iron straps.
Six 3-inch strap hinges.
Two 3-inch by ½-inch bolts with thumb nuts
Nails, &c.

PLATE 95.
This junior farmer club member provides his pig with an oiling post

PLATE 96.
A wooden crate suitable for weighing pigs. Note the strong construction, "slide-up" doors at both ends, and wires coming from bottom of crate to be attached to hook of the spring balance. Softwood should be used in the construction of the crate so that its weight will not be too great.

Shade.

(*See* Plate 85.)

Pigs should be provided with ample cool shade in hot summer months, and this can be done either by planting shrubs or hedges, or by building a framework of 3-inch by 2-inch hardwood and covering the top with bushes or thatching it with grass. Where a clump of natural scrub can be left in the pig paddock, good shade is provided where the pigs can burrow away into the cool and find comfort during the hottest part of the day.

PLATE 97.

Crate in position, ready for use with front door closed. Note the arrangement of the top beam, lever, and spring balance.

Oiling Post.

An occasional application of oil to the pig's skin keeps it in soft and healthy condition, and at the same time the oil destroys lice and other external parasites on the pig. A convenient self-oiler can be made by wrapping a bag or a rope round a post or a tree in the run from the ground level up to a height of 2 feet. The bagging or rope is kept saturated with oil, and the pigs oil themselves by rubbing against the post. Crude petroleum oil or used sump oil is useful for oiling pigs.

Weighing Pigs.

As both pork and bacon pigs are usually sold on a basis of weight and quality, and as the ruling price per lb. varies according to specified weight limits, it is important to the pig raiser that he should have a fairly accurate knowledge of the weight of his animals before they are offered for sale.

On account of pig trucking days being two or more weeks apart in some districts, farmers are sometimes forced to market their pigs either too early or too late to have them at the most profitable marketing weights, but in many cases a farmer is able to market his pigs to much better advantage when he is able to weigh them on the farm at regular and frequent intervals prior to trucking.

Even after years of practice, guessing the weight of pigs is not so reliable as weighing them, and where regular consignments of pigs are sent from a farm the use of weighing scales can be recommended, for, with intelligent use, they soon more than defray their cost in the saving of cash effected by marketing pigs at the most profitable weights.

The crate should be light, yet strong; a convenient size for a crate to hold one bacon pig is 3 feet 6 inches long, 2 feet 6 inches high, and 1 foot 6 inches wide (inside measurements).

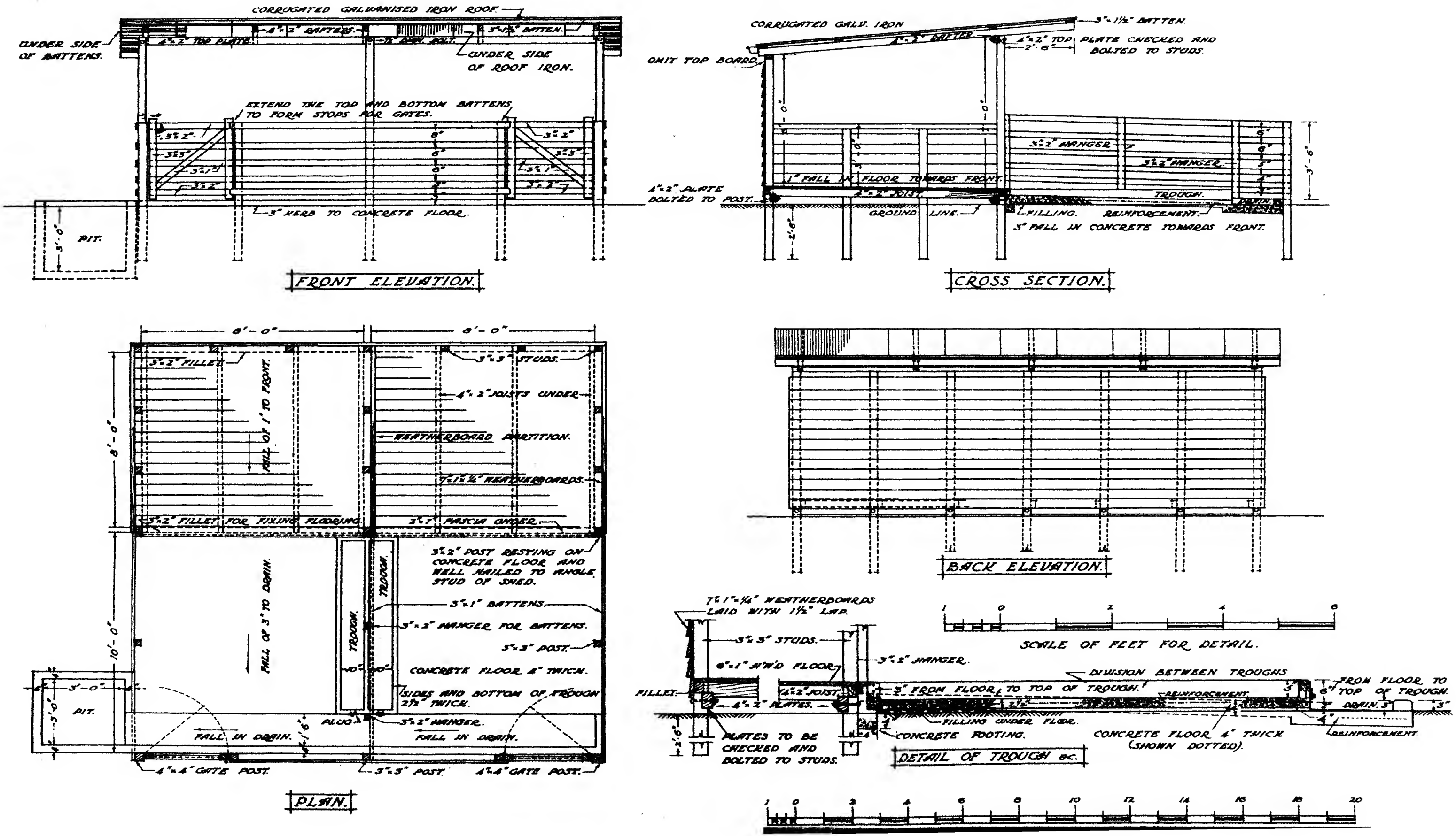
If the weighing crate is arranged in a race, the pigs can be brought from their yard, weighed, and then returned to the yard conveniently.

There are many good methods of weighing pigs on the farm, and the most suitable method must be determined according to circumstances, but the suggestions given herein will be helpful to a large number of pig raisers. Special platform scales with a pig crate built on can be purchased at prices around £50, but at such a price their use must be limited to very large piggeries and trucking yards where large numbers of pigs are weighed.

If you like this issue of the Journal, kindly bring it under the notice of a neighbour who is not already a subscriber. To the man on the land it is free. All that he is asked to do is to complete the Order Form on another page and send it to the Under Secretary, Department of Agriculture and Stock, together with a shilling postal note, or its value in postage stamps, to cover postage for twelve months.

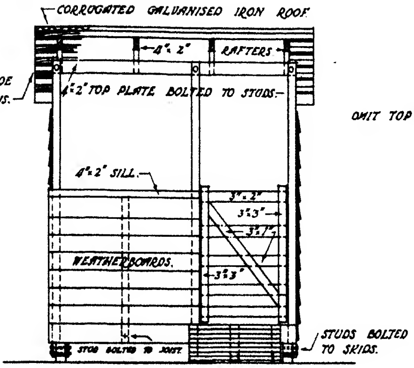
DEPARTMENT OF AGRICULTURE AND STOCK. QUEENSLAND.

PIG PENS FOR INTENSIVE HOUSING.

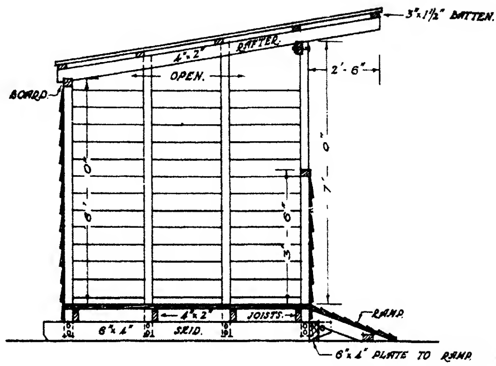


DEPARTMENT OF AGRICULTURE AND STOCK.
QUEENSLAND.

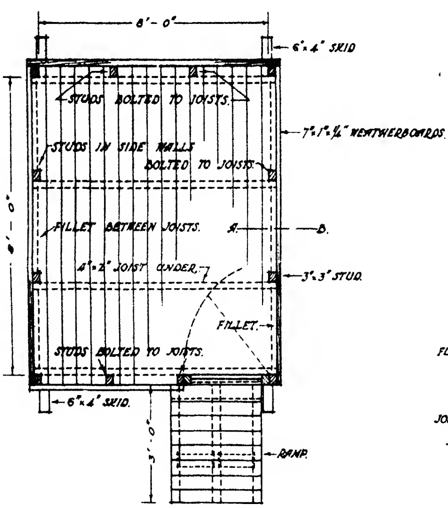
PORTABLE PIG SHED.



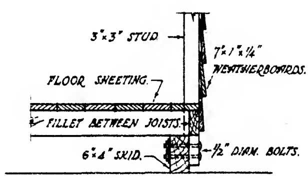
FRONT ELEVATION.



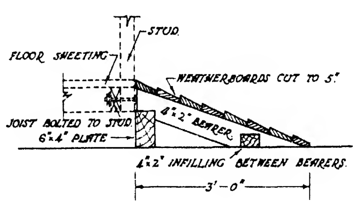
SECTION THROUGH SHED.



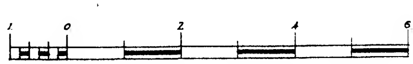
PLAN.



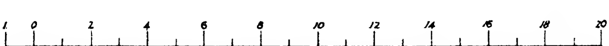
DETAIL SECTION A-B.



DETAIL OF RAMP.



SCALE OF FEET FOR DETAILS.



SCALE OF FEET FOR PENS.

The Feeding of Poultry.

By P. RUMBALL and J. J. McLACHLAN, Poultry Staff,
Department of Agriculture.

THERE is probably no matter of greater importance to the successful poultry raiser than that of feeding. For this reason and to assist in the economical utilisation of the various foods available, poultry raisers should have a thorough knowledge of the principles underlying feeding. Although it is possible for many to buy mixed foods suitable for either egg production or the growth of young stock, it is not always advisable for the commercial poultry raiser to rely solely on these foods, for the distance from the manufacturer adds considerably to their cost; besides it may also be possible for the poultry keeper to make use of foods obtainable in different localities at lower values.

Poultry, as with all livestock, require food first for the maintenance of the bodily functions—that is, the supplying of heat and energy and repair of waste tissue, the surplus only being used for body development, or, in the case of moulting stock, the growth of feather, and in laying stock the production of eggs. It is possible, and it frequently happens, to retard the development of growing stock by incorrect feeding, and in adult stock to just maintain the birds in perfect health without procuring the desired production of eggs. It is, therefore, essential for the poultry raiser to realise at the outset that under-feeding is not conducive to satisfactory results, also that the production of eggs or the bodily growth of young stock can only be obtained by feeding quantities in excess of the bodily requirements of the bird.

To attain success in poultry feeding, a practical knowledge of food values, the classification of ingredients, uses of these ingredients, and the composition of various poultry foods is necessary.

Classification of Food Ingredients.

The food ingredients are generally classified in the following groups:—Proteins, carbohydrates, fats and oils, fibre, ash, and moisture.

In addition to this classification, most careful consideration has to be given to substances known as vitamins, for it has been proved by experiment that it is impossible to obtain correct development in growing stock, or satisfactory egg production from laying hens, with a properly balanced ration of protein and carbohydrates if certain vitamins are absent. Further, the absence of essential vitamins is responsible for diseases of a malnutritional nature and the reduction of natural resistance against diseases.

Protein.

Protein is a compound built up of nitrogen, hydrogen, oxygen, and a few minor constituents. During the process of digestion the insoluble proteins are converted into soluble amino-acids which are absorbed by the walls of the intestines, passing into the circulating blood, by which means they are transported to the various parts of the body to fulfil their functions. There are about twenty known amino-acids many of which are essential to the well-being of the fowl. All forms of these acids are not found in any one class of food, consequently it is necessary to have variety in the ration in order to avoid the absence of any essential amino-acid.

As there is approximately 20 per cent. of protein in the body of the fowl (live weight), the importance of feeding an ample supply of protein can be understood, but it is not wise, in fact harmful, to feed protein-rich foods to excess. In the first place, protein-rich foods are generally the most expensive of the food material available, and for this reason an excess is uneconomic. Secondly, protein cannot be stored in the body for future requirements. The surplus after being converted into amino-acids is divested of its nitrogen by the liver and converted into fat, and is stored as such, and the separated nitrogen voided as uric acid through the kidneys. Therefore, as well as an excess being uneconomic, it places an undue strain upon two vital organs—namely, the liver and kidneys.

Carbohydrates.

Carbohydrates are compounds of carbon, hydrogen, and oxygen. Substances such as sugars and starches are carbohydrates. During digestion these substances are broken down into simple sugars and absorbed. After absorption these sugars combine with the oxygen of the blood and are converted into carbon dioxide and water. The process of oxidisation yields the heat and energy required for the functions of the body. Excess of carbohydrates are stored as fats within the bird.

Fats.

Fats are compounds of carbon, hydrogen, and oxygen. The oxygen content is about 11 per cent., whereas that of carbohydrates varies from 49 to 53 per cent. Fats and oils are used by the bird to supply heat and energy, the surplus being stored as fat. Owing to the greater quantity of oxygen necessary to oxidise fats and oils, due to its lower oxygen content, a given quantity of such substance will create more energy than a similar quantity of carbohydrates.

Fats to be absorbed by the system must first be converted into fatty acids and glycerine. They are not so easily digested as carbohydrates, and should not be fed to excess. As a heat and energy producer fats are worth from 1·9 to 2·5 times as much as carbohydrates.

Mineral Matter.

Mineral matter is that portion of plant or animal life that is left after burning. It is used in building up the frame, and in the fluids of the body to control digestion and absorption. It has been established by practice that all the minerals required by poultry are not present in the usual food supplied on commercial farms, also that the mineral requirement of the fowl varies with age. Only a sufficient quantity of mineral matter is absorbed by the fowl for immediate requirements, consequently a continuous supply must be fed.

Fibre.

Fibre includes the least digestible of foods, such as the outer cells of grains and fibrous matter in plants. Excessive quantity of fibre are to be avoided, as they are not only indigestible by poultry but, when excessively fed, especially in young stock, irritate the intestines.

Vitamins.

Vitamins are now known to be chemical substances, and may be classed as accessory food supplies. No matter how well a ration may

be balanced, without these substances satisfactory results cannot be obtained. There are five vitamins, commonly known as A, B, C, D, and E.

Vitamin A may be referred to as a growth-promoting factor. It is built up by plants, and is found in green feeds, lucerne chaff and meal (commonly used as a green-feed substitute), bran, yellow maize, and whole wheat, and is rich in cod liver oil. The absence of this vitamin in a ration fed to adult stock will cause nutritional roup and render the birds more susceptible to coccidiosis, fowl pox, severe colds, tapeworm infection, &c. Its presence in sufficient quantity will increase production, hatchability, and better development in growing stock.

It has been estimated by one authority that it is necessary to feed with bran and pollard 5 per cent. dry lucerne and 30 per cent. yellow maize meal with grain feeding in the evening of equal parts yellow maize and wheat to supply all the vitamin A necessary to good production.

The most economic form of supply of this vitamin is green feed and yellow maize, while the most convenient, in the absence of either of these foods, is 1 per cent. of a good grade of cod liver oil.

Vitamin B.—This vitamin is common to most of the foods fed to poultry, and no trouble has been recorded due to its shortage.

Vitamin C.—It was at one time thought that poultry were not susceptible to scurvy, but a recent report of an American authority indicated that growing chickens were subject to the disorder, but only after feeding a ration that would not be used commercially. This vitamin does not appear to be of importance in poultry feeding.

Vitamin D.—This vitamin, with vitamin A, is most important in the feeding of poultry. It is essential for the assimilation of the calcium and phosphorus, and naturally most important to the growing birds. This vitamin is present in abundance in cod liver oil, but its cheapest form is sunlight. Sunlight enables it to be developed in the body of the bird. With modern conditions of rearing it happens that chickens, and at times adult birds, do not get all the sunlight they should. In such cases cod liver oil can be used as a substitute. Prolonged over-feeding of vitamin D produces loss of appetite, followed by loss of weight, general ill-health, and ultimately death.

Vitamin E.—This vitamin is associated with reproduction. Investigations have shown that the feeding of rats with a ration in which this vitamin was absent brought on sterility. Sterility was cured by the feeding of small quantities of wheat germ oil. In practice breeders would guard against the possible cause of infertility by feeding good sound wheat or wheat germ oil and green food in the ration of their breeding stock.

Digestibility of Foods.

The chemical composition of a food does not indicate its digestibility, and as regards poultry little is known on the subject. It is a question that can only be definitely ascertained by feeding experiments conducted with poultry.

Palatability of Food.

Results are not obtained by making up a ration with definite proportions of the constituents referred to later unless the fowls will eat

it. If they become hungry enough they will consume a sufficient quantity of almost any food, but it will be at the cost of a very much reduced egg yield. Upon analysis, barley is found to be a food carrying almost the right quantities of protein and carbohydrate essential for egg production, but when put into practice we find that fowls do not relish the grain, and they have to be gradually accustomed to consume it. It may be as well here to mention that in making any change in the ration to laying stock, do so gradually, as sudden changes in the diet cause a reduced egg yield and frequently a false moult.

Methods of Feeding.

Several methods of feeding are commonly practised, and in many instances with equal degree of success. Each method has its own advantage and appeals to the individual feeder.

The methods are known as—(1) wet mash and grain, (2) dry mash and grain, (3) all-mash, and (4) pellets.

Wet Mash and Grain.

The mash is a mixture of different ingredients, moistened to the extent that when a handful is squeezed it will remain in mass form, and when dropped a few inches will break up into small particles. It would be more in keeping with this class of mash if it were termed "moist" instead of "wet."

With this type of feeding the mash has to be prepared daily and distributed to the birds, care being taken to feed sufficient for their requirements and not allowing any to remain unconsumed—say, after an interval of half-an-hour after feeding. The mash should be placed in shallow narrow tins or troughs, and as the food should be consumed within about half-an-hour there should be no lack of feeding space or the more timid class of bird will not procure all that she requires for maximum production.

It is usual to feed wet mash first thing in the morning and grain at night. Many breeders reverse this order with successful results, and find that it fits in better with the daily routine.

Dry Mash and Grain.

A mash similar to that used for a wet mash is prepared and placed in hoppers. Birds are at liberty to consume the food at will, and although certain feeding space has been found necessary for best results the more timid fowl has a better chance of securing its requirements from a limited space than is the case in wet mash feeding. One foot of hopper space should, however, be allowed for each ten birds. The advantage of the system of feeding is that instead of mixing and feeding mash daily a quantity can be prepared and distributed once per week, and so reduce the labour of feeding. The most serious disadvantage, however, that the writer sees in this method is that the constant supply of feed encourages rats to harbour in the poultry pens.

With this system of feeding grain is usually fed during the evening, allowing birds ample time to scratch and find grain distributed.

All Mash.

As the name suggests, nothing but mash is fed. A suitable mixture is made and placed in hoppers. The birds have access to this food at

all times throughout the day. This system of feeding possesses advantages over both the other systems previously mentioned, although it has the disadvantage of encouraging rats. With the all-mash system, quantites of food can be placed out once per week, thereby saving the daily attention of feeding. The birds are also compelled to consume a ration suitably balanced, and from practical experience this system suggests the possibility of preventing breeds of the heavy variety putting on excessive internal fat. Production with this system of feeding is equal to any other. Fowls do not take kindly to radical changes in grain feeding, but with the all-mash system the meal of various grains may be substituted without any appreciable easing in production. Naturally, the converting of grain into meals increases the cost of feeding slightly, but the saving in labour and the assurance that the birds are being fed a ration suited to their requirements appear to justify the slight increase in cost.

Pellet Feeding.

Pellet feeding is nothing more or less than the feeding of an all-mash in the form of pellets. The feeding of the food in this manner enables the bird to obtain a sufficient quantity of food in much less time than when the food is in the form of a mash, but when sufficient hopper space is allowed and the birds have been reared upon all-mash they appear to have no difficulty in consuming all they require. The feeding of pellets is more costly than any other system, due to the fact that they have to be manufactured.

The Feeding of Chickens.

In the feeding of chickens it is most important to bear in mind that nature has provided for the first day or so of the chicken's life, as just prior to hatching the balance of the egg yolk is drawn into the abdomen of the chick. Most breeders allow at least forty-eight hours to elapse before feeding. Chickens fed earlier are subject to bowel trouble. A system of prolonged starving, however, should not be practised, as it has a weakening effect, from which many chickens do not recover.

Requirements for Growth.

Chickens make very rapid growth the early part of their life. This development is most rapid during the first six to eight weeks, consequently rations having a relatively high protein content are necessary to give the best development. From experimentation it has been fairly definitely established that rations having a crude protein content of 20 per cent. should be used during the first six to eight weeks, and after that period reduced to 15 per cent. The protein requirement of a chicken does not alter as sharply as is suggested, but these periods and protein content are suggested as meeting the practical requirements of the poultry raiser.

It is a common practice among many poultrymen to cut down the protein content after the chickens are about sixteen weeks of age, in order to delay sexual development. This, we think, is desirable if the birds are maturing too rapidly, but development can be controlled to only a very limited degree. Excessive protein feeding must be guarded against, as constant and overfeeding of protein-rich foods causes deposits of urates in the ureter, kidneys, and other organs, as well as placing an undue strain upon the liver.

It is generally conceded that milk is the most desirable protein feed for chickens and growing stock, but owing to its cost its exclusive use is not possible. Wherever possible milk should form a portion of the ration. It may be given in the form of curds, semi-solid milk, butter milk, or butter milk powder. As a drink milk is excellent, but it is objectionable owing to the difficulty of keeping chickens clean. The writer favours butter milk powder, owing to the ease with which the powder may be incorporated in the mash, thereby controlling the kind of food that each chicken consumes. It has, however, no definite advantage from a feeding value point of view apart from its concentration. Proteins build up the flesh, but at the same time a bony framework is necessary. Analysis of the chicken at different ages, according to Halman, indicates that it was particularly important to allow for the mineral requirement from the eleventh to the twenty-fourth week. In all experiments conducted by the Department, the increased mineral intake has been allowed for by the addition of bonemeal to the mash at eight weeks of age, and by allowing the birds free access to grit (shell and hard).

Food Consumption of Chickens.

One is often asked how much food should be given to chickens. Probably no better reply can be given than the publishing of a table from actual experiments conducted in this State.

FOOD CONSUMPTION AND WEIGHT OF CHICKENS.

Age.	Leghorns.		Australorp	
	Weight of Chickens.	Food Consumed.	Weight of Chickens.	Food Consumed
	ozs.	ozs.	ozs.	ozs.
Day old	1·3	..	1·36	..
1 week	1·97	1·64	2·14	1·53
2 weeks	3·31	3·36	3·61	3·32
3 weeks	5·31	4·80	5·84	5·05
4 weeks	7·61	6·46	8·68	7·20
5 weeks	9·94	7·58	12·08	6·89
6 weeks	12·92	8·96	15·86	10·62
7 weeks	16·65	8·65	20·17	13·95
8 weeks	20·41	13·29	25·31	15·05

The variation in weight from week to week and the ever-increasing amount of food required suggests the undesirability of indicating what should be supplied.

The food requirements increase week by week, and a system of feeding where the growing birds may consume all they require is the most desirable.

The all-mash method of feeding chickens by reason of the fact that the kind of food consumed is easily controlled, and that it is always in front of the birds, is suggested as being the most desirable. All-mash should be placed in shallow trays about 1 inch in depth during the first few days. The trays are then increased to a depth of 2 inches, and by the end of the first week troughs about 4 inches wide may be used. At this age chickens will commence to scratch, scattering the feed from the trough. This can be prevented by placing a piece of

netting on top of the mash loose enough to sink as consumption takes place. During the first week 8 feet of feeding space should be allowed for every 100 chickens, and later increased to 12 feet. Prior to the mash being covered with netting it is important that only a little food at frequent intervals should be placed in the trays in order to avoid wastage.

In fact, the frequent feeding of all-mash appears to induce a greater food consumption, with the result of better development.

Breeders who do not desire to feed an all-mash could make use of commercial chick grains and growing mashes. These could be fed as directed by the manufacturers. It has been the general custom for many poultry raisers to use scratch grain only for a short period of a chicken's life, but in the view of the more satisfactory results obtained by feeding a ration of a relatively higher protein content than chick mixtures usually have, early mash feeding appears essential.

Chickens may be reared satisfactorily upon moistened mashes and grain from about two weeks of age, but the mashes must be fed at frequent intervals. This system offers the advantage of utilising milk as a medium of moistening the mash when such is available. The feeding of dry mash, however, is suggested as a safer method of feeding, as the possibility of food becoming sour, with the probable consequence of bowel trouble among chickens, is avoided.

Suitable All-mash Mixture.

The following mashes have been used successfully in experiments conducted by the Department, and are suggested as a basis upon which to work. At times it may not be commercially sound to stick hard and fast to the ingredients suggested, but from the table of analysis supplied it will be possible for the breeder to compound other suitable mixtures.

Ration.	1–8 Weeks.	8 Weeks to Maturity.
Maize meal	40	56
Bran	20	10
Pollard	20	10
Meat and Bone meal	7½	5
Dried buttermilk	10½	5
Salt	1	1
Cod Liver Oil	1	1
Peanut meal	..	10
Bone meal	..	2
Crude protein content	17·15	18·07

The ration in this test from eight weeks to maturity carried a greater protein content than subsequent tests have proved essential, likewise better results have been obtained with rations of higher protein content during the first period. The suggestion is made that 20 per cent. should be the standard for the first eight weeks, and then reduced to 15 per cent.

Requirements for Egg Production.

The laying fowl has first to provide from her food supply for—

(1) Maintenance of vital functions;

(2) Growth requirements; and

(3) The production of eggs.

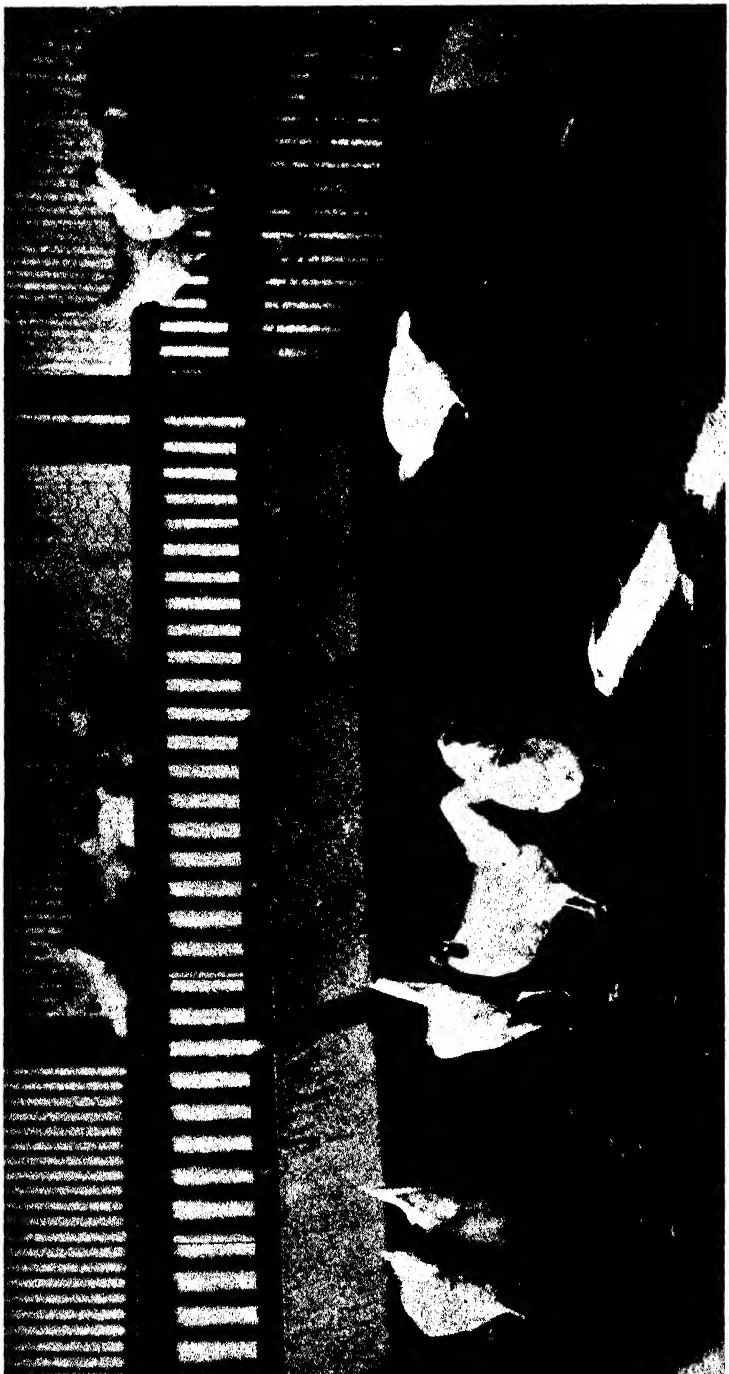


PLATE 98.
Automatic feeding hoppers in use on a poultry farm near Brisbane.

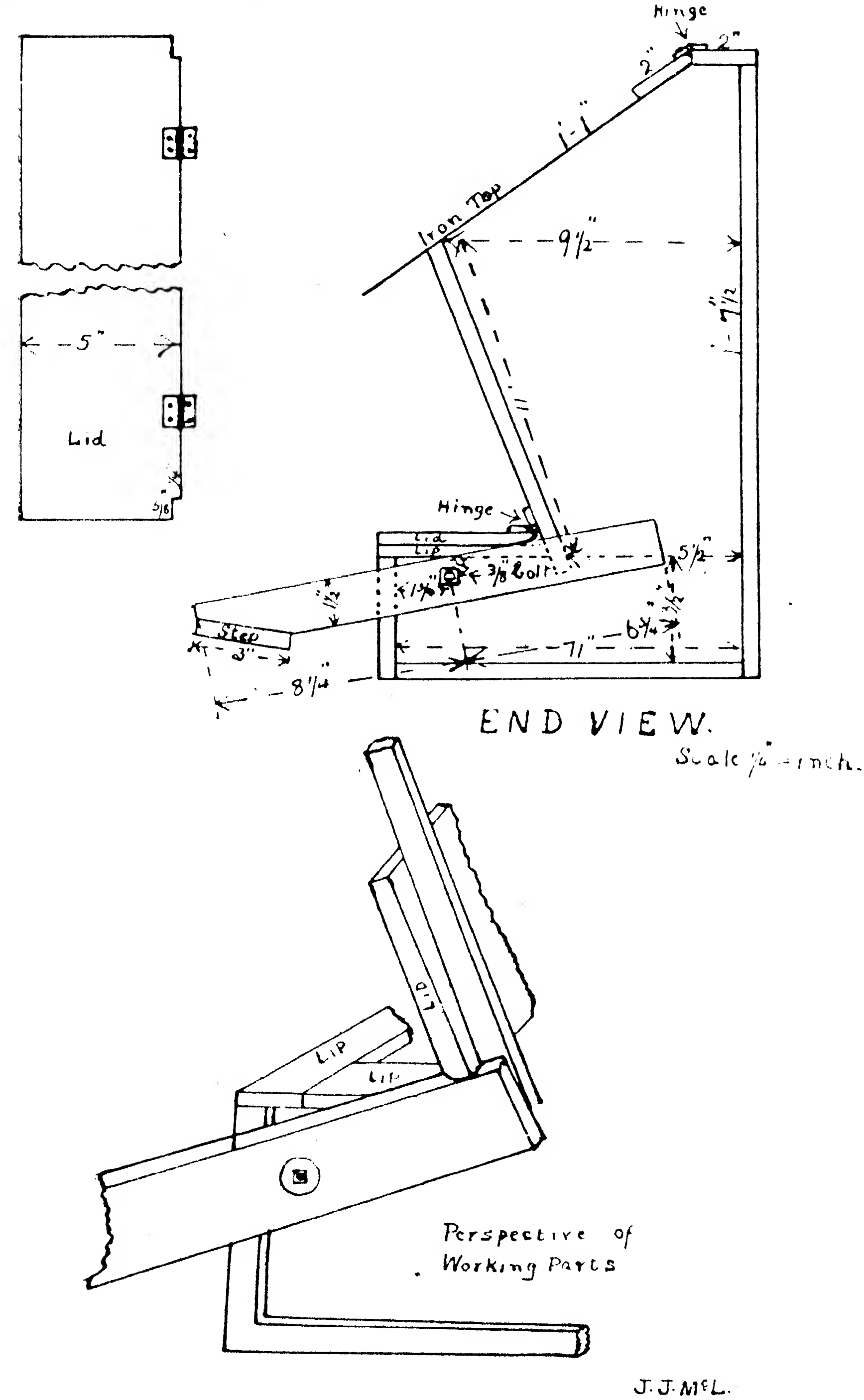


Plate 99.
Plan of automatic feeding hoppers as illustrated.

The first call upon the food supply is for that of vital functions, then growth, and any surplus nutrients used in the manufacture of eggs. It will therefore be seen that the greater the production the greater will the consumption be, and that egg production is only possible by feeding quantities of food in excess of body requirements. It is generally estimated that a hen in full lay will consume approximately 2 ounces each of grain and mash per day. This quantity, however, will be in excess at times, and again be deficient during the period of peak production.

The majority of cereal foods available are generally deficient in protein, and in preparing a ration it is necessary to use protein-rich foods in the form of milk, milk powders, and meat meal. Protein-rich vegetable foods are available, but it has been found from experience that animal proteins give better results than vegetable. This probably is due to their greater palatability and to the fact that the range of amino-acids is wider. From practice it has been found that rations having a total protein content of 15 per cent. give satisfactory results. As protein-rich foods are the most costly, it will readily be understood that the object of the feeder shouid be to use the minimum quantity necessary for maximum production.

The poultry raiser who does not desire to prepare his own ration may purchase laying mashes to be fed in conjunction with grain, also all-mash. These laying mashes have approximately 18 to 20 per cent. of crude protein, and when fed in conjunction with grain, say equal parts of maize and wheat, the total crude protein content of the ration is reduced to the vicinity of 15·5 per cent.

In addition to the protein and carbohydrate, the mineral content of the layers' ration has to be taken into consideration. The average amount of carbonate of the egg shell is one-fifth of an ounce. To supply the requirements, say, in the mash, 4 per cent. of calcium carbonate would be necessary, but as hens not laying would only void the material it is a better practice to have shell-forming material in the nature of limestone and shell grit always before the bird in separate receptacles.

Commercially, yolk colour does not appear to have as yet caused us any concern, but the consuming public do not like an excessively pale-yolked egg, and to overcome this green feed and yellow maize should form a definite part of a laying ration. Both foods are rich in vitamins, and green feed materially assists in supplying the mineral requirements of poultry. In the absence of green feed lucerne chaff or meal should be used.

The manner in which layers may be fed varies. All systems previously referred to have been proved successful. The most popular at the present time is the feeding of dry mash and grain, although all-mash is coming more into vogue. For those who desire to prepare their own mixture the following rations are suggested as a working basis:—

Ration—Grain and Mash.

Mash.	Per cent.	Grain.	Per cent.
Lucerne chaff or meal	10	Wheat	50
Bran	28	Maize	50
Pollard	30		
Maize meal	20		
Linseed	2		
Meat meal	10		

Supplements to each 100 of mash—

½ lb. Salt.
2 lb. Bone Meal.
1 per cent. Cod Liver Oil.

All Mash.

	Per cent.
Meat Meal	5
Lucerne Chaff	6
Linseed	1
Maize Meal	30
Bran	20
Pollard	40

Supplements—

Bone meal	2 lb.	To every 100 lb. of Mash.
Salt	½ lb.	
Cod Liver Oil	1 lb.	

Care of Moulting Hen.

It is a common practice among breeders to give little attention to moulting birds. In many instances they receive nothing but a grain ration. Feathers contain a considerable amount of protein, and the most economical manner of getting birds back into production is to feed protein-rich foods as provided in a laying ration. Moulting may be induced by the feeding of nothing but grain at or about the time birds usually moult. When once the moult has commenced laying rations should be supplied, as it will take about a fortnight for the manufacture of the first egg after the moult is completed.

Fattening.

Two classes of birds have to be considered—old hens and cockerels. The ability of the feeder to do much with old hens in good condition is questionable, but those slightly out of condition could be improved with ten to fourteen days' crate feeding. From experiments that have been conducted it has been found just as economical to rear cockerels to the various marketing stages on the growing rations used for pullets. Ten to fourteen days crate feeding of these birds would undoubtedly add to their market value. As the old hens or young cockerels are to be handled they should be freed of external and internal parasites before being submitted to a fattening process. The crates could be small coops 2 feet wide, 3 feet deep, and 3 feet high. These crates would hold about six birds for the period, and if the floor is wire netting and off the ground, the evacuation would fall through and the birds be kept clean. The front should be of wire or slats wide enough apart for the birds to get their heads through to enable feeding from a trough in the front. An all-mash mixture of a relatively high protein content fed as a gruel three times a day will undoubtedly improve condition. With this system of feeding water is not necessary. Any food left over, say, after half-an-hour should be removed in order to keep the appetite keen. A mash of equal parts maize meal and pollard, plus 10 per cent. butter milk powder and 5 per cent. meat meal, is suggested.

Preparation of Mashes.

On the majority of farms the various ingredients that go in the making of mash are either mixed with a shovel upon the floor of the feed room or in some trough.

If the mash is to be fed wet it is a good idea to soak the lucerne chaff or meal in water over night. Just sufficient water should be used to make the mash of the correct consistency and the salt used in the mixture dissolve in the water first. This ensures an equal distribution.

In making a dry mixture the salt should be added to the protein-rich foods in order to increase the bulk through which the salt is distributed. This action ensures an even distribution of salt throughout the mash.

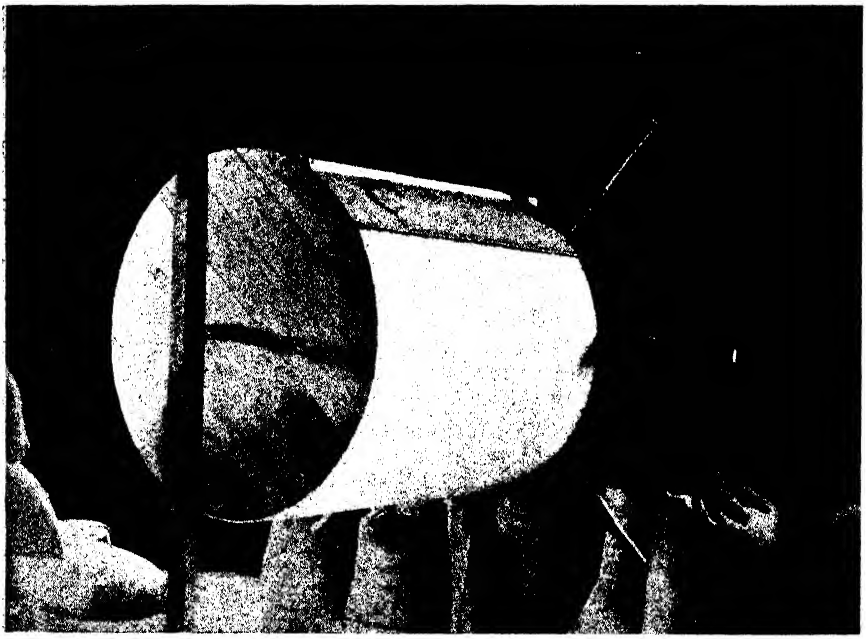


PLATE 100.
A handy mash mixer.

When using cod liver oil, to ensure an equal distribution it will be found most convenient to incorporate it in the bran in the first instance.

Much labour will be saved and better mixing of the various ingredients ensured by using a mash mixer. An appliance that serves the purpose is easily constructed by the poultry raiser. The mixer consists of a drum constructed of 22-gauge galvanised sheet iron with tongued and grooved pine ends, as illustrated. A pipe of 1¼-inch diameter is passed through the centre of the drum, fitting into hardwood bearings at each end. This pipe can be keyed to the drum by boring a hole through the pipe close to the drum and using a piece of No. 8 wire as a key. Naturally, the No. 8 wire has to be bolted to the drum.

The mash is mixed by a tumbling process, and to assist in raising the mash on the side of the drum while it is revolving four battens should be attached lengthwise inside the drum 2 inches from the iron. The battens should be of 2½ by 1-inch timber. They are necessary for the thorough mixing of dry mash.

The diameter of the drum is 3 feet 6 inches, and the length equal to the width of the iron. The sheet iron to pass around the drum will

have to be riveted end to end, and the sides attached to the pine ends every 2 inches with screws. A convenient size opening, the full length of the drum, must be left for filling. A sliding close-fitting door must be provided.

Dry-mash Hoppers.

It is most difficult to design a dry-mash hopper that is thoroughly efficient in all respects; however, the accompanying illustration will prove quite satisfactory. This hopper, being wider at the bottom than the top, tends to obviate the trouble of mash sticking up, which is so common in other designs. In addition, the lip on the feeding trough will prevent much wastage of mash. Such a hopper could be built in lengths to suit the number of birds, allowing 1 foot of feeding space to every ten birds. The feeding space, however, could be increased where all-mash is fed by allowing 1 foot to every eight birds.

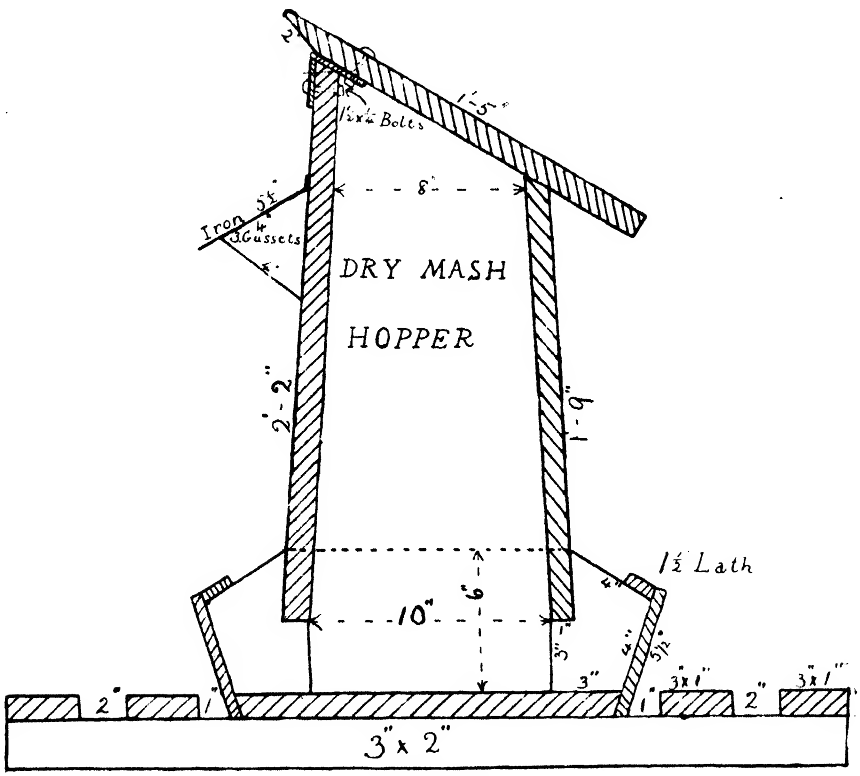


PLATE 101.

Wet mash should be fed in troughs or on a sheet of iron; after the birds have consumed the mash these receptacles should be stood up to avoid contamination.

Turkey Feeding.

No food should be given for at least forty-eight hours after hatching. Hard grit, charcoal, and water should be the first food provided. The hard grit assists in mastication, and charcoal has no equal as a bowel corrector. Turkey chickens will gorge themselves if allowed, and this

gorging is responsible for a considerable amount of trouble. Turkeys in their wild state would gather their food very slowly, and it is found best to imitate them as far as possible by feeding the young chickens only a little at a time, and fairly frequently. This prevents them from overloading their digestive organs, and helps to retain that keenness of appetite which is essential to success.

Stale bread soaked in milk and then squeezed fairly dry is the most handy food on the farm, and also gives excellent results. This can be fed five times a day for a few days, and variety can be added by the replacement of some of the meals with chick grains, mashes of bran and pollard mixed with milk, to which can be added a small amount of minced meat, and tender green feed. This mash should be made crumbly and not sticky.

When on range the quantities of food will vary according to what they can gather for themselves, but surplus milk can be fed at all times either thick or fresh, but it is as well to always feed it in the same condition. Green feed should be fed in abundance to both growing and adult stock, but where range is allowed on good green pasture it is not so important.

Grains should always be fed at night, and so induce the flocks to return to their camps. Oats, maize, and wheat are suitable for this purpose.

In the management of turkeys, especially in the rearing of young stock, cleanliness is essential. Food should not be allowed to lie about or become decomposed, and a strict outlook must be kept for vermin of all sorts.

Duck Feeding.

Ducklings require no feed for forty-eight hours after hatching. During this period they should have water, coarse sand, and charcoal constantly before them. A mash that will give good results if fed from the first meal until they are about four weeks old is prepared by mixing together—pollard, 10 lb.; maize meal, 8 lb.; dried butter-milk, 2 lb.; bonemeal, ½ lb.; fine salt, 2 ounces. If this mash was mixed, the amount for each meal could be moistened as required. Feed several meals daily—a little, and often, is a good motto. After four weeks they could be fed a mash similar to that fed to the adults.

Adults mash—

	Per cent.
Pollard	55
Bran	25
Maizemeal	10
Meatmeal	10
Bonemeal	1
Fine Salt	½

Feed growing stock three meals daily. With adults, a small meal of whole maize could be fed in the evening in addition to the mash. In fattening ducks, cheap foodstuffs in the form of potatoes, pumpkins, &c., could be boiled and added to the mash to the extent of 40 per cent. Chaffed young greenstuff should be added, but when using other cheap foodstuffs omit it, otherwise the mash would be too bulky.

Water.

Ducks must always have access to drinking water. This is *most important* with ducklings, and the water vessels should be deep enough for them to submerge their heads. Many ducks die annually, and the cause can be attributed to lack of water.

COMMERCIAL FOODS AND THEIR FEEDING VALUE.

Barley.

Not a popular food among poultry-keepers nor do fowls consume it readily. It has a fair feeding value, but in order to increase its palatability it should be soaked or sproated. When corn and wheat are high in price, barley could be used to the extent of 50 per cent. of the grain mixture, but the change over should be gradual.

Beans and Peas.

When whole, stock do not take kindly to either of these grains; crushed they add to the protein content of the mash, and may be used to the extent of 10 per cent.

The Grain Sorghum.

In the drier areas this crop can be grown successfully when maize or wheat are failures. They are slightly higher in protein content than maize, but do not contain the fats. Feterita and Milo are preferred, and are extensively used by some breeders with a good deal of success and economy in feeding. Some varieties of the grain, notably Kaffir corn, are credited with a binding effect on the bowels, but as an offset against this plentiful supplies of green feed can be used.

Maize.

This is one of Queensland's staple grain crops of which poultry are very fond. Large grain needs to be cracked, but the smaller varieties can be fed whole. When purchasing maize for grain feeding, it is as well to try and secure the small whole grain. The quality is then easily judged, and there is no waste. Cracked grain should always be sieved before being used, and the fine powder used in the mash. If the grain is fed extensively, it is inclined to lay on internal fat, but it can be used to the extent of at least 50 per cent. of the grain ration with safety. Yellow corn should be used in preference to the white on account of its content of vitamine A.

Oats.

In some places oats is one of the principal poultry foods. Most of Queensland's supply is, however, imported, and it therefore cannot be used economically in large quantities. It is, however, desirable to add variety to the ration of breeding stock by using a proportion of this grain.

Rice.

In the northern portion of Queensland, where this grain is grown, it may be possible to use quantities economically. It is a very starchy food of a fattening nature, but can be used to the extent of one-third of the grain ration. Crushed or ground rice needs to be used with care, owing to its tendency to go rancid.

Wheat.

This grain provides the bulk of our poultry food supplied. It is readily consumed by poultry, and can be fed as a part of any grain ration or used by itself, the market price of various grain foods available being the guide as to the quantities used. Plump wheats of a hard nature are of better feeding value than pinched grain or full soft grains.

Bran.

Bran is rich in protein and mineral matter, but carries a fair quantity of fibre. This fibre is useful in adding a certain quantity of bulk to the ration. It also assists in making a mash when fed wet of a nice consistency. Use at the rate up to 30 per cent. of the mash.

Pollard.

Pollard has a greater proportion of carbohydrates than bran, but not so much ash and fibre. It forms the principal constituent of mashes, and may be used to the extent of 60 per cent. of the total mash supply.

Maize Meal.

This meal is of especial value in fattening poultry. Certain quantities should be used in all mashes.

Ground Oats, Rolled Oats, and Hulled Oats.

Ground oats—that is, oats without the hulls—is an excellent food for both laying and growing stock, being rich in protein. The use of these foods is largely governed by the price.

Linseed Meal.

Fairly rich in oils and proteins, but contains a good deal of fibre. It may be used to the extent of 2 per cent. in the laying mash, and increased slightly during the moulting period.

Cotton Seed Meal.

Cotton seed meal, on analysis, would appear to be a splendid food for poultry, but in practice the extensive use has not given good results. A good grade may be used to the extent of 5 per cent., but never exceed this quantity.

Peanut Meal.

A very nitrogenous and easily digested meal. The keeping quality of the food is poor, being inclined to go rancid, but it may be used to assist in building up the protein content of mashes.

Meat Meals.

Meat meals vary considerably in their analysis. They are essential for high egg-production. The quantities to be used would vary according to conditions under which poultry are kept. In closed runs where no other class of animal food is available, they may be used to the extent of 10 per cent., but with stock on free range during periods when animal food in the form of insect life is plentiful, the quantity should be considerably reduced.

Dry Crushed Bone and Bone Meal.

These materials are essential for the development of the bony structure of young growing stock and beneficial to laying birds. Quantities up to 5 per cent. may be used. Poultry keepers who are a distance

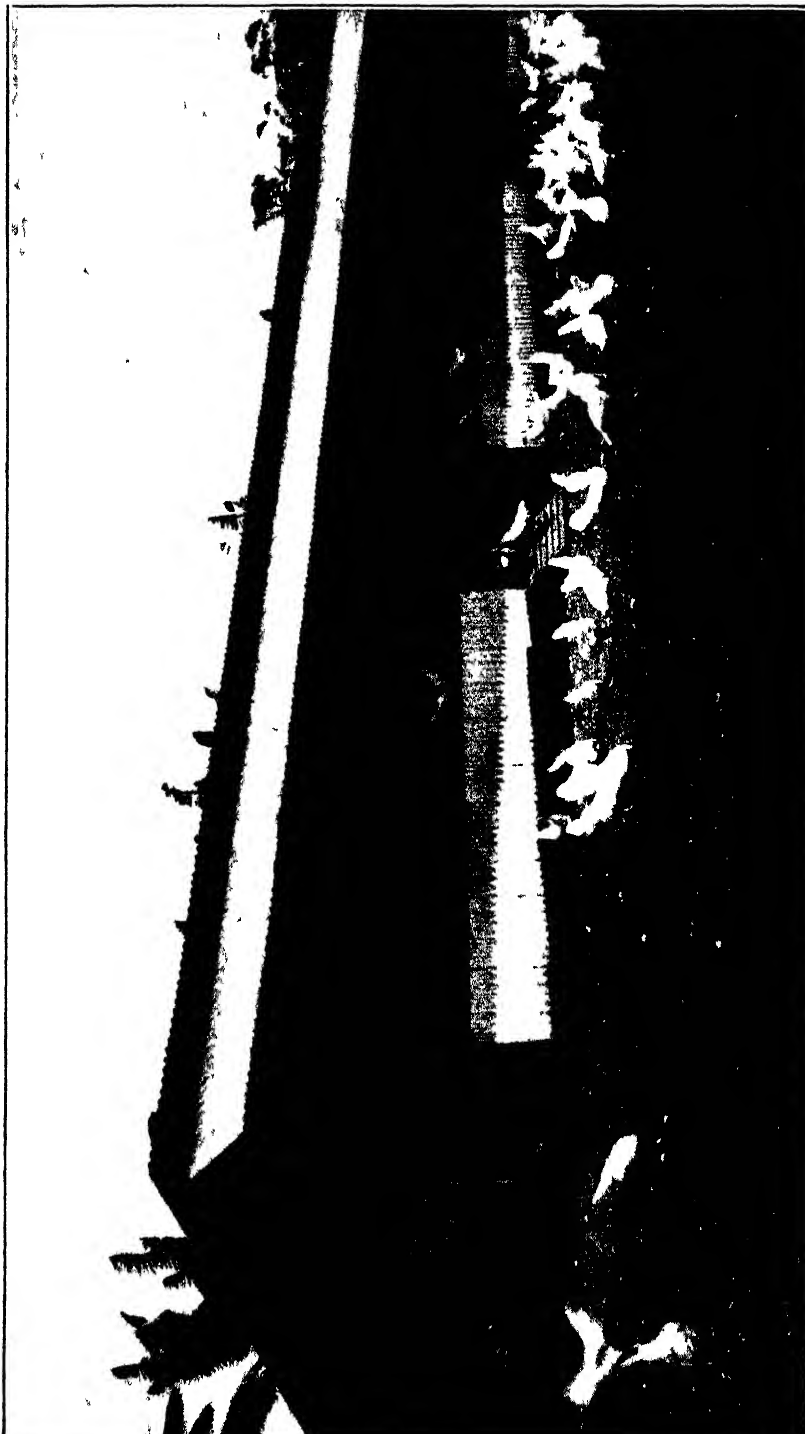


Plate 102.—An intensive laying house on a poultry farm near Brisbane, built according to the plan shown on page 169 of the February issue of the Journal.

from markets could burn any bones about the place, which renders them easily crushed, and so have a supply of mineral matter suitable for feeding to young growing stock.

Milk.

If all poultry keepers had a good supply of skim milk or butter-milk there would not be such a large number of poorly developed stock on our farms. There is no better animal food for stock than milk or milk products. In a sour state it is recommended by some authorities as preventative of diarrhoea and coccidcosis. In feeding, however, vessels need to be kept clean, and although the milk is being fed in a sour state, putrification needs to be avoided.

Dried Buttermilk.

This is an excellent food for those who have not the fresh product, and in a State such as Queensland, where the dairying industry is so extensive, poultry breeders should be assured of a continuity of supplies. Milk and milk products appear to be a tonic as well as a food, and highly suited for laying stock, growing stock, and breeding stock. When used for the latter purposes, it has been our experience that the hatchability of the eggs has been increased. It may be used as the sole source of animal food, or in conjunction with other forms of animal food. The price will govern its use.

Green Feed.

Some sort of succulent green food is essential to maintain the health and vigour of stock, not so much by reason of its nutritive value, although certain quantities are supplied, but to act as a natural tonic on the fowl's system.

It has long been recognised as an important food for poultry, but it is only during recent years that scientists have found that green foods have been supplying an element essential to life. Green feed stimulates the liver and increases the secretion of digestive juices. The kinds of green feed most valuable and relished by fowls are the young, tender-growing portions of lucerne, lettuce, kale, rape, silver beet, barley, oats, maize, &c. In fact, all green foods are good, but it should be young or tender. The quantity used is dependent upon supplies and general conditions. When feeding by itself, say, at midday, give the birds as much as they will eat. If used in a wet mash, the quantity could be as high as 25 per cent. of the bulk, and during droughty periods, when poultry foods are costly, green feed can be used to the extent of 60 per cent. of the mash; but when fed in these quantities, two mashes, one at 7 a.m. and one about 1 p.m., should be fed daily, followed by a grain feed, say, at 5 p.m. Poultry have not a great holding capacity, hence the necessity of feeding two mashes to enable them to deal with the necessary bulk to obtain all the nutriment required.

When fresh green feed cannot be obtained, lucerne chaff or meal make an excellent substitute. This class of food, being dry, however, cannot be used to the same extent as if green. By weight, 12 per cent. should be the limit. If feeding on the wet mash, the dry lucerne can be soaked over-night with just enough water to mix the mash. This softens the lucerne, making it more easily digested.

Grits.

Shell grit, limestone, or crushed bone, for the purpose of supplying the necessary material for bone and egg-shell formation, should be

provided. Plentiful supplies of oyster shell or ground lime should always be available, while bone may be supplied either in the form of meal or grit.

Hard Flinty Grit.

Hard pieces of rock, sand, &c., are necessary to poultry for the grinding of their food, and should also be in free supply, particularly with stock confined to pens. Without grit it is impossible for stock to thoroughly digest their food, and any system of feeding where this is not supplied is wasteful.

Charcoal.

This can be fed either in the mash or be available to stock at all times. When it is desired to feed powdered charcoal in the mash it should be used at the rate of 2½ per cent. Charcoal is valued for its mineral content and its action as a bowel corrector.

In feeding all grit continuity of supply is essential, otherwise stock are liable to gorge themselves, with resulting troubles in the nature of distended crops, &c.

Salt.

With a good system of feeding—that is, variety and plenty of green feed—there is generally a sufficient supply of salt to meet the body requirements, but small quantities, 8 oz. to every 100 lb. of mash, makes the food more palatable, with the result of greater consumption and production. Salt, however, needs to be well mixed with the mash; when wet mash is fed it can be dissolved in the water, but when fed dry too much care cannot be exercised in thoroughly distributing it throughout the mash, owing to its poisonous nature when excessive quantities are consumed by poultry.

Composition of some Poultry Foods.

CRUDE NUTRIENTS.

Food.	Protein.	Fat.	Carbo-hydrates.	Fibre.	Ash.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Barley	8·6	1·5	71·0	2·7	2·2
Beans	25·4	1·5	48·5	7·1	3·2
Kaffir corn	9·9	1·4	74·9	1·5	3·0
Maize	9·5	4·0	69·3	2·8	1·4
Oats	10·3	4·8	58·2	10·3	3·1
Rice	7·6	1·9	66·7	9·3	4·9
Wheat	12·8	2·0	67·7	2·4	1·7
Bran	15·8	2·6	56·3	9·8	4·9
Cotton-seed meal (decort.)	41·0	7·0	29·0	8·0	6·0
Linseed meal (new process)	27·2	0·8	40·7	13·9	6·2
Maizemeal	8·6	3·7	71·4	2·0	1·3
Peanut meal	47·6	8·0	23·7	5·1	4·9
Pollard	15·7	3·6	61·4	5·8	3·1
Meatmeal	54·4	8·0	6·1	..	23·5
Skim milk	3·8	0·1	4·9	..	0·8
Dried buttermilk ..	34·5	1·1	49·1	..	8·3
Lucerne chaff	20·7	1·4	40·9	20·0	9·0

Queensland Weeds.

By C. T. WHITE, Government Botanist.

BLUE WEED OR PATERSON'S CURSE (ECHIUM PLANTAGINEUM).

Description.—An erect herbaceous weed, mostly 1 to 2 feet high, but sometimes much larger under favourable conditions of soil and climate; stems and leaves covered with rather long, stiff, scattered, rough hairs. Radical leaves large and sometimes dying-off in the older plants; stem leaves narrowly oblong in shape, cordate at the base, pointed at the apex, 2 to 4 inches long. Flowers purplish-blue, borne in dense clusters (one-sided cymes) at the ends of the main branches and upper side branches. Calyx green, hairy, divided nearly to the base into five segments, one-third to half an inch long. Corolla purplish-blue, but sometimes purplish-red, or even white, about 1 inch long. Stamens five, two of them longer than the others and exserted. Seeds (nutlets) borne in fours inside at the base of the calyx, small, only about 1 line in diameter, angular and very tuberculate (rough).

Distribution.—A native of the Mediterranean region, now a common naturalised weed in Australia. It is said to have first been introduced into Victoria as a garden flower about 1875, but it was not reported to be spreading as a weed until about 1896. From then on its spread in Victoria, South Australia, and New South Wales was increasingly rapid. It is difficult to say when it first came to Queensland; the earliest record in our collections is 1916, when we received specimens from Yandilla.

Common Names.—In New South Wales and Victoria it is commonly known as "Blue Weed" or "Paterson's Curse." In South Australia it is most generally known as "Salvation Jane." In England and America species of *Echium* are commonly called "Bugloss" or "Viper's Bugloss."

Botanical Name.—*Echium,* the ancient Greek name of a plant of this family, and derived from *Echis,* a viper, from the resemblance between the seeds and the head of a viper (J. C. Loudon); *plantagineum,* Latin in reference to some similarity of the leaves to those of the genus *Plantago,* which contains the plants variously known as Rib Grasses, Plantains, Lamb's Quarters, &c.

Properties.—It is not known to possess any harmful or poisonous properties. The first leaves are succulent and palatable, and stock will eat them readily enough, but the plant soon becomes harsh and is left entirely alone. I have heard it spoken well of as a bee plant.

Eradication.—At the present time the areas infested in Queensland are probably not so great but that they can be hand-treated by cutting off the plants well below the surface of the ground.

Botanical Reference.—*Echium plantagineum* Linnaeus Mantissa II., 202.

PLATE 103.—BLUE WEED OR PATERSON'S CURSE (*Echium plantagineum*).

1. A flowering stem (approximately half natural size). 2. Flower (Corolla) laid open × 2. 3. Pistil × 2.

Agricultural Notes.

By H. S. HUNTER, Agricultural Branch.

SEASONAL PROSPECTS.

UNLIKE the two preceding seasons, the normal late-summer rains, on which so much depends for the winter months, have not failed to materialise. Copious and widespread rains in February, over practically the whole of the State have guaranteed a continuance of the favourable season. Since April, 1933, when belated monsoonal rains brought relief from a severe dry spell, the agricultural areas of Southern Queensland have received rains at frequent intervals, which came, in many cases, at an opportune time to prevent any serious setback to the growing crops. Since the breaking, last year, of the long drought in the Central district, that area also has experienced a run of favourable weather.

Last month's general rain resulted in the disappearance of the remaining stronghold of drought, in the Winton-Hughenden area, and pastoral and agricultural Queensland now is in such shape as to view the approach of the autumn and winter months with confidence. Provided the appropriate farming operations for the system of short-fallowing and moisture conservation are given effect to, the advent of seasonal rains in late summer has an important bearing on the successful growing of winter cereals, in that the autumn and winter months normally do not yield sufficient moisture for the needs of wheat and like crops.

It is inevitable that some damage would be sustained by heavy rains at the present time, especially in the agricultural districts. Severe flooding occurred on two occasions during the month in parts of the far North Coast.

Sugar.

Continued rains in the far North provided conditions which were favourable for crop growth except where the control of weeds has not been possible. Temperatures have been abnormally low throughout February, so that the cane growth has not been so vigorous as is normally experienced at this season.

In Mackay and Bundaberg a dry spell was experienced in mid-February which caused a temporary check to the cane crops, but the beneficial rains of the past week have enabled them to recover, and good yields may now be expected in these districts.

Early forecasts for Queensland as a whole suggest that a further heavy crop will be harvested; it is as yet too early to state whether it is likely to exceed that of 1933.

Maize.

Extended areas and a favourable growing season are factors which indicate that a heavy yield may be expected this season. Some losses may have been sustained in low-lying areas in the coastal districts from floods, especially where the maize had lodged from the effects of previous heavy rains.

Harvesting of the mid-season crop now is general, particularly on the Darling Downs, where extended plantings were made this season. Consignments totalling 200 tons of maize, mostly to Southern States, are reported to have left the Allora district alone within the first two weeks of the month.

Continuous wet weather hampered planting operations on the Atherton Tableland, where the area under maize is estimated at 16,000 acres, or 4,000 acres less than last season.

Cotton.

The late February rains were urgently needed in most cotton-growing districts to develop the top crop of bolls, and it now is practically certain that a record yield for the State will be obtained. With average conditions for the rest of the season excellent crops are expected, especially in the Upper Burnett, where a large acreage of medium to late-planted cotton exists.

Where proper cultural practices have been adopted, good yields from early-planted crops also are in prospect. Many nicely developed early planted crops are to be seen in the Mundubbera and Callide Valley districts.

An outstanding feature of the season, in most districts, is the pronounced freedom from attacks by the corn ear worm, which often has caused damage in past years. The lack of damage is noticeable particularly where clean cultivation has been maintained. Where severe attack from corn ear worm occurs, it frequently is found that the fields are infested with pig weed and bull head, both of which weeds are attractive to the moth of this pest.

The ginneries now are open for receipt of consignments of early cotton, which is being harvested in the Central district. Harvesting should be more general within the next few weeks and will extend to about July at the earliest.

It is pleasing to note that arrangements have been made whereby it will be possible for the Australian cotton spinners to contract to buy 12,000 bales of cotton from the coming harvest.

Tobacco.

The season, so far, has been most discouraging for the tobacco grower due, principally, to the difficulty of raising seedlings, owing to the prevalence of blue mould. The infestation of this disease has been particularly severe in most districts, the humid conditions having been conducive to its development.

In many cases where the Department's recommended preventive sprays have been carefully used, success has attended the efforts to raise seedlings, but very often these measures have been rendered ineffective by rain washing the spray material from the plant.

In the Mareeba district, plantings which were effected in November and December have reached the curing stage and are resulting in the production of exceptionally bright leaf, with an encouraging absence of the spotting trouble which was so prevalent during the past two seasons.

However, in the majority of instances, shortage of plants has unduly delayed transplanting, and at the commencement of the month the area planted would not exceed 600 acres, or less than half the area planted at the corresponding time last year.

In the tobacco areas to the hinterland of Townsville, blue mould interfered with planting operations, notably at Hervey's Range, where the growers are endeavouring to raise a fresh lot of seedlings in time for planting out. Better success has been obtained in the Woodstock, Sellheim, Ravenswood, and Charters Towers districts, where some of the crops have made excellent and uninterrupted growth with a noticeable absence of leaf spot.

In the Southern areas, the delay in transplanting is more serious, owing to the danger that the crops will encounter frost. Blue mould has been the main trouble at Beerburrum, Park Ridge, and in the Texas and Inglewood districts. In the latter two areas, where tobacco is grown under irrigation, the unusually heavy rains have caused losses in the field from stem rot.

Numbers of growers, chiefly share-farmers, have ceased operations in the Texas and Inglewood districts and this fact, together with losses from disease, has accounted for a considerable reduction in the collective area, which is calculated at about 450 acres or less than half that of previous seasons.

Leaf, which is now being cured from the early plantings, is showing better colour than usual.

TOBACCO—TOPPING AND SUCKERING.

The main object of topping and suckering tobacco is to hasten maturity. These practices are also important factors in the production of quality leaf, writes the Tobacco Expert of the New South Wales Department of Agriculture in current notes.

The natural thing for the tobacco plant to do is to set seed, but by removing the flower head (i.e., topping) as soon as it appears, seed setting is prevented and much of the plant food material that would have been used up in seed formation will be made available for leaf development. Tobacco plants that are allowed to go to seed or produce suckers have thin papery leaves of poor texture, body, and weight.

Topping results in lateral shoots soon making their appearance at the leaf axils and at the base of the plant. Naturally, if these are not removed they also will develop and set seed heads at the expense of the tobacco leaves.

To determine at what height the plants should be broken off it is essential that the vigour of the plant be first carefully observed, and the earliness or lateness of the season should also be taken into account. Then, too, the question of obtaining uniformity in ripening over a fair area of the crop to facilitate an even and sufficient picking for flue-curing must be considered.

With well-grown and early light and bright types of tobacco it is usual to leave about fourteen or fifteen leaves to come to maturity. With late tobacco it is often advisable to leave only nine or ten leaves, excluding the damaged bottom leaves.

Many growers do not fully realise the damage they are doing to their crop in allowing suckers to grow too large. Suckers should be removed as soon as they can be conveniently grasped in the fingers and not permitted to grow longer than 2 inches.

Seasonal Notes.

By H. W. BALL, Assistant Experimentalist, Agricultural Branch.

CULTURAL operations in the wheat areas will now be well advanced, and care should be taken to see that workings become shallower as seeding time approaches.

Spring tooth and rigid tine cultivators are preferable to disc implements for working the fallows.

A late disc cultivation does considerable harm by spoiling the necessary consolidation.

If sheep are given access to the paddocks, they can be of great assistance in keeping down weed growth, thereby reducing cultivation and helping to consolidate the soil.

By efficient cultivation much of the heavy summer rainfall can be conserved for use by the future crop.

Where wild oats are a problem and it is not desired that bare fallowing should be resorted to, the infestation can be reduced by sowing an early maturing crop of rye, barley, or wheat as a fodder crop, to provide grazing for sheep, and to be subsequently ploughed in before any grain ripens.

Or, alternatively, the land can be well worked to encourage the germination of the wild oats, which are then cultivated out, and a late sowing made with a suitable variety of wheat.

Suitable varieties of wheat may be sown towards the end of April for hay purposes.

Varieties such as Cleveland and Currawa are also sown with a view to feeding off during early growth to sheep.

The main sowing of lucerne should be made during the March-April period.

Lucerne prefers a fine, well-prepared seed-bed, preferably in a calcareous soil, and the value of the crop well repays a little extra trouble at the beginning.

As weed growth is not so pronounced during the winter months, the young lucerne has an excellent chance of becoming established if sown at this time.

It has been found that lucerne is a valuable crop to sow for grazing in the outlying farming areas and pastoral country, having a rainfall in the vicinity of 20 to 25 inches per annum.

A light seeding of 3 to 4 lb. per acre is sufficient to produce a stand, which, if judiciously grazed, will carry considerably more stock per acre than the natural pastures, particularly during the winter months.

CAULIFLOWER CULTIVATION.

SUPPLIED BY THE FRUIT BRANCH.

THE colder months are the best for the growing of cauliflowers, and it is necessary, therefore, to plant out in time to ensure their heading during that season.

In the southern coastal districts the planting of the seed is done between February and April, the Tableland districts from February to May, and the inland districts from February to March. In the northern district from February to May on the coastal, inland, and tableland areas.

Cauliflower plants are usually raised in seed-beds. The beds should be well prepared, and if the soil is too heavy it may be improved by adding other soil of a sandy nature. The soil should be finely raked and the seed sown in drills about a foot apart and covered with about a quarter of an inch of soil or well rotted manure. When the young plants appear they should be kept well watered, and within four or five weeks they should be ready for planting out. This is best done under moist conditions. Care is essential in removing the young plants from the beds, and the young roots of the plants should be kept moist at all times.

The Agricultural Chemist in his pamphlet on complete fertilizers states:—Cauliflowers require a very rich loam and a heavy dressing of farmyard manure.

When using from 10 to 15 tons of stable manure per acre, when the ground is being prepared, the following mixture of artificial fertilizers should be applied per acre when planting:—

3 to 4 cwt. of nitrate of soda.
4 to 6 cwt. Nauru phosphate—superphosphate mixture.
1 to 2 cwt. sulphate of potash.

The latter to be applied in top dressings. Without farmyard manure use, per acre—

4 cwt. of nitrate of soda or sulphate of ammonia,
6 cwt. of Nauru phosphate—superphosphate mixture,
2 cwt. sulphate of potash

when planting, and two or three top dressings of 1 cwt. of nitrate of soda each.

While the plants are growing, cultivation should be thorough but should cease when they begin to head, because cultivation at this stage causes the head to become loose and coarse.

To keep the head white it is necessary to protect it from the sun, and this is done by tying the tops of the leaves together over the head as soon as it begins to form. Cutting the heads for market is best done in the morning, and care must be taken not to bruise them, for each bruise appears as a black mark.

Cauliflowers should not follow a cabbage crop or occupy the same ground for two consecutive seasons. Cauliflowers are usually planted in rows 3 feet apart, with 2 feet between the plants, and 1 lb. of seed planted in drills is sufficient to plant an acre. Varieties recommended are Primus, Early and Late Phenomenon, and Eclipse.

CARE NEEDED IN BRANDING PIGS.

Reporting to its shareholders recently, the North Queensland Co-operative Bacon Association, Limited, advised that an appreciable number of the pigs forwarded for slaughter have been treated too severely in branding, the branding having been carried out too heavily, causing loss in the finished article, hams and bacon, through the manufacturer having to cut out the portion which has been too deeply branded, thus reducing the commercial value of the side, flitch, or ham respectively.

Improper fire branding of pork and bacon pigs inflicts a heavy loss on the bacon trade annually. It has been definitely proved that body tattoo branding is much to be preferred to fire branding, and this system is now being advised by the majority of factories and is practised by all the principal buyers of market pigs.

COLD STORAGE OF FRUIT—KEEPING QUALITIES OF DIFFERENT VARIETIES.

It is well known, observes a pamphlet issued by the New South Wales Department of Agriculture on the cold storage of fruit, that the keeping quality of similar varieties of fruit grown in the same orchard does not remain constant. It may vary from season to season. It depends upon (*a*) soil, (*b*) rainfall, (*c*) care in handling, (*d*) size of fruit, and possibly upon other factors.

Generally speaking, if the cool store is operated upon proper lines, very little loss will occur, always supposing that the fruit has been picked at the right stage of maturity and handled carefully, and that conditions were studied carefully during the growing period. When light crops are harvested and the fruit is large it will not keep so well as when the crop is normal and the fruit is of medium size. Since heavy rain immediately before picking prejudicially affects the keeping qualities of fruit, in a wet season careful watch should be kept on the fruit in storage. It is recommended by some that in such a season the temperature in the cool chambers should be maintained slightly higher than in a season of normal rainfall.

The information at present available concerning the keeping quality, &c., of the different commercial varieties of fruits is summarised as follows:—

APPLES.

Jonathan.—A good storer if picked when well coloured. Large fruit goes "sleepy" if held any length of time. Jonathan spot causes losses and should be closely watched. This variety does not scald to any extent.

London Pippin.—Holds until November if picked when the ground colour is changing and placed in store straight from the tree.

King David.—Stores well in some seasons, but not a very sound variety to rely upon.

Delicious.—If picked when well coloured and placed in store straight from the tree, it will hold up well till October or November. Flavour improves in store.

Tasma.—A splendid storer, which keeps well till the last, except oversized fruit from young trees, which goes "sleepy."

Yates.—A splendid storer, which keeps to the last.

Dougherty.—Stores well sometimes, but not a very sound variety.

Granny Smith.—The general practice is to pick this variety in April and leave in well ventilated stacks until June, by which time the skin develops an oily feeling. The fruit is then wrapped in oiled paper and placed in store. It holds well till December. This variety should never be stored except in oiled wrappers, otherwise scald is likely to develop when the fruit is removed from the store.

Rome Beauty.—Stores satisfactorily when well coloured, but should not be held too long.

Rokewood and Grafton.—Both store very well.

Stayman Winesap.—Goes "sleepy" if held too long and consequently should be cleaned up by the end of July.

For long storage, apples and pears should be picked at the right stage for the variety, and after being allowed to cool down overnight placed straight into cool store. Delayed storage is satisfactory only as regards the Granny Smith and is fairly satisfactory for the Tasma, although the latter will hold longer if put straight into the store after picking.

PEARS.

Williams'.—Stores well for one or two months, but is risky beyond that time.

Packham's.—One of the best storers, but should have a tinge of yellow before picking, and should go straight into the store.

Winter Cole.—One of the best storers, but should go straight into the store from the tree if intended to hold for long.

Josephine.—Ripen quickly when they start and consequently should be closely watched. A very good storer.

Winter Nelis.—Very good storer.

Howell.—Liable to skin blackening on removal.

Beurre de Capioumont.—Hardly worth holding.

Beurre Bosc.—Holds well for short storings.

Glou Morceau.—A tender skin variety, holds well, liable to blackening or marking after removal from store.

PLUMS.

Although the time for picking plums is not so important as in the case of peaches, they should not be picked too early. A slightly acid taste seems best to define this condition. President is the most satisfactory storer, while Grand Duke and Pond's, and in fact most European plums, will hold well for short storage—three or four weeks.

PEACHES.

Picking at the correct time is a most important factor. Some varieties of peaches are characterised by a definite ridge, which is the first portion to become soft at ripening. Such a variety should be picked about a day prior to softening, which stage should be judged by the eye and not tested by pressure.

HISTORY OF SUGAR.

In an address before a Sydney popular science club, Mr. P. H. Goldfinch, general manager of the Colonial Sugar Refining Company, traced the history of sugar from the year 337 B.C., when the soldiers of Alexander the Great in India found the natives chewing sugar-cane, which they called "the honey-bearing root."

The earliest evidence of sugar being consumed in solid form, said Mr. Goldfinch, was found in Persia in the year 627 of the Christian era. It was introduced into Egypt and from there crossed the Mediterranean, and spread along the coastal areas as far as Spain. Up to about the year 1400 the juice was squeezed out of the sugar-cane by hand, and was concentrated by being dried in the sun. The Venetians, however, developed a process of refining the crude and sticky mass, and they turned out quite a respectable crystal sugar. They kept the process a close secret, but eventually gave it away. The people of Great Britain developed a taste for this new and pleasant form of food. After purchasing crude sugar from foreign countries they refined it in England for consumption for those who could afford to buy it. In 1688 fifty small sugar refineries were operating in Great Britain. The method of manufacture was very haphazard, and continued to be comparatively primitive until sixty years ago. At that time 14 tons of cane was required to make a ton of crystal sugar, whereas to-day, 1 ton of superior sugar is made from 7 tons of Australian-grown cane.

Mr. Goldfinch said that in 1817 Thomas Scott attempted unsuccessfully to establish canegrowing on the Hastings River. No further attempt was made to produce sugar commercially in Australia until about 1852, when Captain Hope made the first sugar from Australian cane grown in Brisbane, and manufactured in a hand mill. In 1877 there were sixty-eight small sugar-mills in Queensland, mostly horse-driven, and thirty mills on the Clarence River in New South Wales. Not one of them was in existence to-day, their places having been taken by thirty-seven large, powerful, and up-to-date mills which produced about one hundred times as much sugar as the whole ninety-eight mills did formerly.

The people of Australia consumed about 320,000 tons of sugar a year, said Mr. Goldfinch. It was all produced in Australia—about 96 per cent. in Queensland. Australia made from 500,000 to 550,000 tons a year, and the surplus was sold to Great Britain and Canada.

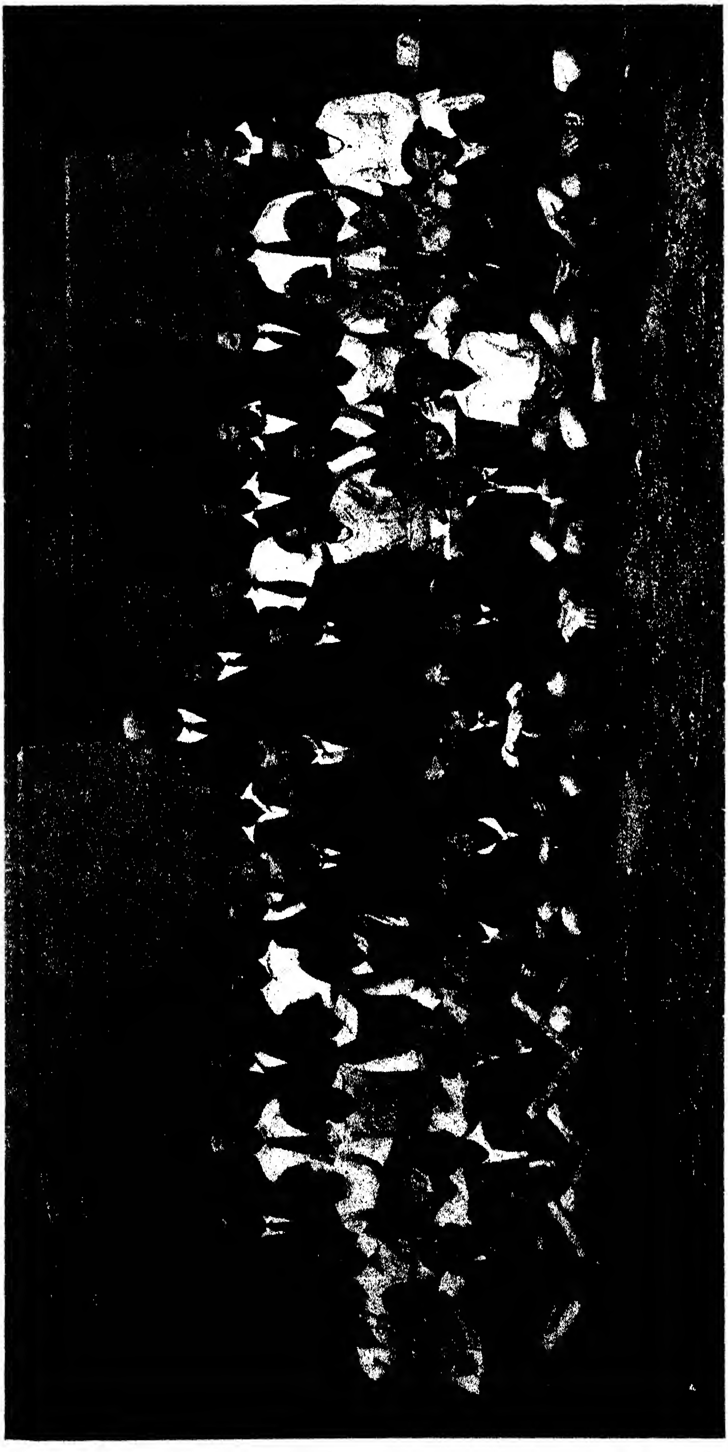


PLATE 104.

MORNINGSIDE (BRISBANE) STATE SCHOOL PROJECT CLUB,

on a visit to the Department of Agriculture and Stock. Standing in the rear is Mr. Robt. Wilson, Assistant Under Secretary, and seated in the centre (left to right) are Messrs. Rumball (Poultry Expert), Krause (Teacher in Charge), and Reid (Editor of Publications).

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Jersey Cattle Society, the Australian Illawarra Shorthorn Society, and the Guernsey Cattle Society, production charts for which were compiled for the month of January, 1934 (273 days period unless otherwise stated):—

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	JERSEY.			
	MATURE COW (OVER 5 YEARS), STANDARD 350 LB.			
Pineview Buttercup	J. Hunter and Sons, Borallon	7,886 05	427 17	Carnation Lad
Carnation II. of Woodlands	D. R. Hutton, Cunningham	7,029 25	380 276	Cream Sultan of Rosedale
Princess II. of Ferndale	D. R. Hutton, Cunningham	7,[illegible]4 0	374 056	Janet's Palatine of Rosedale
	SENIOR, 4 YEARS OLD (OVER 4½ YEARS), STANDARD 330 LB.			
Carnation's Pride of Calton	L. A. Peirce, Graceville	9,220 22	435 723	Retford Meteor
	JUNIOR, 4 YEARS OLD (UNDER 4½ YEARS), STANDARD 310 LB.			
Pineview Locket	J. Hunter and Sons, Borallon	6,754 64	386 394	Oxford Buttercup's Noble
Countess III. of Woodlands	D. B. Hutton, Cunningham	7,426 98	347 48	Carnation Golden Duke
Oxford Erin (269 days)	E. Burton and Sons, Wanora	5,549 66	322 37	Oxford Renown
	SENIOR, 2 YEARS OLD (OVER 2½ YEARS), STANDARD 250 LB.			
Trecarne Milk Girl III	D. R. Hutton, Cunningham	6,636 32	370 993	Trecarne Golden King
Canary II. of Fernlea	Kittle Bros., Gleneagle	5,767 13	335 083	Norwood Noble Boy
	JUNIOR, 2 YEARS OLD (UNDER 2½ YEARS), STANDARD 250 LB.			
Pineview Myrtle	J. Hunter and Sons, Borallon	4,932 85	295 856	Oxford Buttercup's Noble

AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Redberry of Rosehill	W. Flesser, Boyland	11,965·59	440·784	Master of Oakvale
JUNIOR, 4 YEARS OLD (UNDER 4½ YEARS), STANDARD 310 LB.				
Woranga Frances II.	R. Ray, Yargullen	8,138·0	367·034	Young Charmer of Newholme
JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB.				
Cinderella of Oakvale	B. O'Connor, Colinton	9,876·7	432·129	Kitchener 2nd of Burradale
Beauty of Oakvale	B. O'Connor, Colinton	9,048·35	367·022	Kitchener 2nd of Burradale
Rosehill Gentle II.	W. Flesser, Boyland	7,592·82	274·73	Phinquil of Oakvale
GUERNSEY.				
JUNIOR, 3 YEARS OLD (UNDER 3½ YEARS), STANDARD 270 LB.				
Moonji Dodo Perfection	W. R. Smee, Peeramon	5,857·75	323·111	Caramara Favour

Answers to Correspondents.

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. Cyril T. White, F.L.S.

Derris trifoliata.

I.B. (Townsville).

Derris trifoliata is fairly common in North Queensland from about Mackay northwards. It is a scrub or rain forest climber, and the stems are used by the natives as a fish poison. It bears three to five leaflets and sprays of pea-shaped flowers. If you think you see it in the local scrubs at any time you could forward specimens for identification. *Derris trifoliata,* so far as we know, is not a marketable product and nobody is collecting it. We believe the only species at present collected commercially is *Derris elliptica,* the Tuba Root of Malay, and Singapore is the chief port of export.

Blue Panic Grass.

J.W. (Guluguba)—

The Blue Panic Grass, *Panicum antidotale,* does not, so far as we know, contain any prussic-acid-yielding glucoside at any stage of its growth, and is not known to be poisonous or harmful in any way. The feed value, we should say, is unquestionably high, and the grass, though somewhat cany in nature, has one good feature: that is, it sends out tufts of leaves all up the stem, and these tufts provide young, nutritious feed.

The important point in pasture management nowadays is to have young, short, succulent grass, but, as you know, in the West this is almost impossible, because you would have short grass at one time and no grass at another. A certain quantity of standing feed is essential.

We have read of your experiments with grasses with great interest. Among those you are trying, have you tried *Phalaris tuberosa.* This makes a wonderful winter feed and should be sown in the autumn, but stock have to be kept off it until it is established.

Coastal Button Grass.

J.A.O'S. (Carruchan)—

The specimen is the Coastal Button Grass, *Dactyloctenium ægyptium,* a grass very widely spread over the warmer regions of the world. It has been established in North Queensland for a number of years past, and of late years seems to be on the increase. We have not had much experience with this grass as a fodder, but reports so far received seem to indicate that it is palatable and nutritious. The grass grows well during the summer months and dies out on the approach of the colder weather.

Sword Bean and Jack Bean.

G.H.B. (Bouldercombe)—

Your specimen is the Sword Bean, *Canavalia gladiata,* the common tropical bean cultivated to a limited extent in Queensland. The bean should be used with caution, as it does not apparently suit all stomachs, but we know of many cases of people who have used the young pods sliced in the same way as French Beans and who have said they were excellent. A far better variety is *Canavalia ensiformis,* the Jack Bean. This bean we have cultivated ourselves and used the young pods in the same way as French Beans, and the nearly ripe seeds in the same way as Lima Beans. We are sending you a few seeds under separate cover, in case you may like to try this variety.

Good Fodder Grass *(Leptochloa decipiens.)*

E.R.W. (Inglewood)—

The specimen is *Leptochloa decipiens,* a grass with a fairly wide distribution in Queensland, but nowhere, we should say, very abundant. It seems to favour rather sheltered positions, such as on the edge of brigalow scrubs, &c. It is quite a good fodder and seems to be readily eaten by stock. It possesses in rather a faint degree a prussic-acid-yielding glucoside, but apparently not in sufficient quantities to cause any trouble.

Broad-leaved Carpet Grass.

H. (Maryborough)—

The specimen is *Axonopus compressus*, the Broad-leaved Carpet Grass, a native of the Southern United States and tropical America, now naturalised in most tropical and sub-tropical countries. It has been established in Queensland for a great number of years, but only comparatively recently has it become common in the more southern parts of the State. The grass probably has value for dairying purposes on second-class country, particularly near the coast, but is not to be favoured where better grasses, such as Paspalum, Rhodes grass, &c., can be grown. A great deal of controversy has centred around this grass of late years, and in two parts of the State requests have been made to investigate its spread into the Paspalum pastures, the claim being that, in closely-grazed pastures, when it makes its appearance it dominates the pasture, making it, in comparison, almost useless. In America the grass is spoken quite highly of, and pastures of it are laid down, but the general experience in Queensland is that, though it may have value on second-class country, there is a danger it will invade and dominate first-class country to the exclusion of Paspalums, clovers, and better class pasture grasses and herbage generally.

Japanese Clover.

G.W.C. (Gympie)—

The specimen is *Lespedeza striata*, Japanese Clover. This, and other species of *Lespedeza*, have attracted considerable notice as fodders of recent years. Have you any idea how the present plant came to be on your property? Though supposed to be of only recent introduction, we have received specimens of this particular plant this year from Caboolture, and it is reported to be growing wild there. Reports from abroad seem to speak highly of the plant, but in Queensland as yet we have had no actual experience with it as a fodder. It is a legume, however, and should be quite nutritious and a valuable introduction to the pasture. Your specimen bore no seeds or flowers, and later on we would like further specimens to verify the determination.

Cultivation of Mitchell and Flinders Grasses.

J.C. (Fernlees, C.Q.)—

We have visited the property of Dr. Hirschfeld at Bybera, near Inglewood. He has made a great success of the cultivation of Flinders grass and Mitchell grass. An acre of Flinders grass on ploughed land is a picture. It shows that this grass can be grown over a much wider range than is generally supposed.

Creeping Saltbrush.

H.H. (Gladfield)—

The specimen is *Atriplex semibaccata*, commonly known as Salt Weed or Creeping Salt Bush. It is fairly common on some parts of the Downs, particularly on the western Downs, and is generally regarded as quite good fodder for stock. Stock often do not take to these Salt Bushes when other feed is available, though sometimes they will acquire a liking for them and keep them well cropped down, even though other feed is available. They often prefer them somewhat when they are drying off to when they are growing in a very luxuriant state.

Townsville Lucerne.

H.C.H. (El Arish)—

The specimen is *Stylosanthes mucronata*, the Townsville lucerne. This plant has been naturalised in North Queensland for many years, and its introduction in many places has no doubt considerably increased the carrying capacity of the pasture. We do not think there is much fear of its becoming a weed in the canefields, as it is growing in many cane areas and no trouble has been experienced from it so far. It is a legume, and ploughed in should make quite good green manure. It is also, we should say, fairly easy of eradication. It grows during the summer months, seeding and dying off on the approach of the colder weather, say, about April or early March. The plant is relished by stock when it is drying off somewhat—in fact, they often seem rather to reject it when very green and luxuriant.

White Root.

B.D. (Murgon)—

The specimen is *Lobelia purpurescens*, the White Root, a native plant that sometimes becomes a serious weed in cultivation. It is one of the most pernicious weeds we have, and the most difficult to eradicate. The only means of eradication that we know is to keep on regularly checking the green growth above the ground, so that the underground parts must eventually become exhausted by rapidly sending up fresh shoots and getting no nourishment in return. When the roots are dug up, care should be taken that they are gathered together and destroyed, for every little piece that falls or is broken and remains in the ground makes a new plant. Sprays, as a general rule, are not very satisfactory when applied to these plants, and in any case they are rather difficult to spray in garden beds where other plants are present. If the bed is vacant, you could spray with a weak weedicide, such as a weak arsenical solution. If there is any objection to using a poisonous spray, you could dig the plants up and spray the exposed roots and any green parts with, say, a solution of common salt, or with kerosene. Salt must be applied in dry weather to be effective. If the roots are sprayed with kerosene and then burnt this is a great aid.

Honey Locust.

J. O'N. (Gayndah)—

The specimen forwarded is *Gleditschia triacanthos*, the Honey Locust, a native of North America. The pods are said to have some reputation as a fodder. We have no experience of the effect of the foliage on milk and cream, but should not think it would taint them any more than a lot of other green fodders, such as lucerne, &c. The plant is not known to be poisonous or harmful in any way. In Queensland it is mostly planted in the cooler parts of the State, particularly on the Darling Downs. It is deciduous, and, like some other legumes, is rather subject to borer attack.

African Box Thorn.

THE SHIRE CLERK (Cloncurry)—

So far as we know, *Lycium afrum*, the African Box Thorn, is not growing in your shire. As far as Queensland is concerned, the only places where we have seen it as a pest are a few places on the Darling Downs and in the Maranoa district. We think it was at the instigation of some of the people in the latter district that the plant has been declared a noxious weed throughout the State. It has spread very much in some of the Southern States, particularly in South Australia, and fears are entertained regarding its spread in parts of Queensland. At the present time, we have no leaflet dealing with it, but the following description may help you:—It is an upright growing shrub, 4 to 6 ft. high, the branchlets ending in stout, strong spines. The leaves are small, rather thick, and slightly fleshy. The flowers are cup or bell shaped, and white, veined with violet. The fruit is a bright red round berry, containing numerous small seeds. It is half an inch or nearly half an inch in diameter.

A Poisonous Plant.

H.M. (Red Hill)—

The specimen is *Euphorbia tirucalli*, a native of northern Africa and western Asia. The milky sap of the plant is an intense irritant, is poisonous, and it is very dangerous to have the plant growing where there are children. If the sap gets into the eyes it causes intense pain and temporary blindness.

Pigeon Grass.

C.H.H. (Kingaroy)—

The specimen is *Setaria glauca*, a grass very widely spread over many of the warmer regions of the world, and commonly known as Pigeon Grass. It is quite abundant in parts of Queensland, mostly growing either in damp situations or as a weed of cultivation. It is quite a good fodder and belongs to the same genus as such well-known cultivated fodders as Hungarian Millet, Panicum, &c.

Florida Beggar Weed.

H.T.P. (Tulagi, British Solomon Islands Protectorate)—

As far as can be told from the single specimen, we think the plant is *Desmodium tortuosum*, the Florida Beggar Weed. It is asked if there is any difference between *Desmodium triflorum* and *Desmodium trifolium*, but we cannot trace the latter name in any literature at our disposal. The plant does not belong to *Desmodium triflorum*, but to *Desmodium tortuosum*, as stated before. The plant is a legume. It has considerable reputation as a cover crop for enriching the soil, and as a cattle fodder. It grows to a great height under cultivation, but soon deteriorates into a very poor weedy plant, especially on poorer soils. I think the plant is worth growing as a cover crop and a cattle fodder in the Solomon Islands, but its value can only be told by experiment. Florida Beggar Weed is much cultivated as a fodder crop and green manure in many tropical and sub-tropical countries. It is grown to a very limited extent in Australia.

Dysphania myriocephala.

W.R. (Warra)—

The weed is *Dysphania myriocephala*, and is very common in many parts of Queensland, though we have not heard a common name applied to it. The plant is decidedly poisonous, containing a prussic-acid-yielding glucoside. It would be particularly fatal to travelling stock which came on to it fairly hungry, for they would naturally eat it in large quantities.

Beautiful Tree for Street Planting (*Barklya syringifolia*).

H.P.J. (Wooroolin)—

The tree, *Barklya syringifolia*, would make a very beautiful street tree for planting in the Kingaroy district. It is an evergreen. We should think it would be frost tender in its younger stages. A well-grown tree would be about 25 to 30 ft. high. About 30 ft. apart would be a good distance to plant the trees. So far as our experience goes, this tree is of rather slow growth in its younger stages.

Crowfoot Grass.

T.T. (Birkdale)—

The specimen is *Eleusine indica*, Crowfoot Grass, fairly common in Queensland, but widely spread over the warmer regions of the world. It is essentially a weed of cultivation and waste places, and comes up on farms and cultivation headlands, around cow yards, &c.—in fact, anywhere where the ground has been disturbed or made bare. It is eaten by stock, but we would not say it was of much value as a pasture grass. Like members of the Sorghum family, it contains a prussic-acid-yielding glucoside, though we cannot say that any deaths caused by it have come under our notice in Queensland.

Immature Crops Bad for Pigs.

A.T. (Toowoomba)—

With reference to feeding of store pigs on young saccaline, the Agricultural Chemist, Mr. E. H. Gurney, advises:—"In young stages of growth of the saccaline variety of sorghum, it usually has a high prussic acid content. As a second checked growth is likely to occur when grazed by pigs, it is considered this practice would be attended with danger."

The Senior Instructor in Pig Raising, Mr. E. H. Shelton, advises:—"Our own experience is that it is unwise and unprofitable to allow pigs of any description to graze on immature crops, especially where there is a danger of poisoning. In the case of saccaline, it is the thick juicy stalks that have maximum feeding value, the crop being grown for that purpose and not for the leaf growth, as in the case of wheat, oats, and barley, where they are grown for use in the leafy form and not as grain. We have also had reports of danger attending the feeding off of second-growth corn stalks—that is, the young shoots that spring up when corn stalks are cut for silage-making. However, pigs are fairly immune to poisoning of the description referred to, as they do not usually eat a sufficient quantity at any one time. In this sense they are unlike cattle, which eat a very large quantity in comparison and then lie down and chew the cud. It does not pay to take risks, so our advice is to keep the pigs off the young saccaline until it comes into head. After that, it can be fed with safety as portion of the daily ration."

CROWN LAND FOR GRAZING SELECTION.

CASSILIS RESUMPTION.

Approval has been given for the opening for Grazing Homestead Selection of Cassilis Resumption, containig 33,600 acres, at the Land Office, Richmond, on Thursday, 12th April, at 11 a.m.

The area is situated on the eastern boundary of the holding, about 40 miles south of Richmond.

Term of lease will be twenty-eight years, and the rental 2d. per acre for the first seven years of the term.

The block is all high, open, undulating, brown-soil downs, well grassed in normal seasons, with Mitchell, Flinders, and other grasses.

Water supply consists of one sub-artesian bore, equipped with windmill, tanks, and troughing.

Other improvements on the block consist of fencing.

The selection will be subject to a condition requiring the maintenance of the existing rabbit netting fencing, and will require to be stocked to its reasonable carrying capacity with the applicant's own sheep within a period of three years.

Proof must be furnished of the financial standing and pastoral or land experience of the applicants.

Free lithographs and full particulars may be obtained from the Land Agents, Hughenden and Richmond, the Land Settlement Inquiry Office, Brisbane, and the Government Intelligence and Tourist Bureau, Sydney.

BURENDA RESUMPTION.

Approval has been given for the opening for Grazing Homestead Selection of a subdivision of Burenda Resumption, containing about 23,000 acres, at the Land Office, Charleville, on Tuesday, 27th March, 1934.

The block is situated north-easterly from Augathella, about 72 miles from Charleville.

The term of lease will be twenty-eight years, and the rent will be 3d. per acre for the first seven years of the term.

The selection will be subject to the maintenance of the existing rabbit and dog-netting fencing, and will require to be stocked to its reasonable carrying capacity with the applicant's own sheep within a period of three years.

Proof must be furnished of the financial standing and pastoral or land experience of the applicants.

The portion is first-class sheep country, comprising principally all high, undulating black and brown soil plains, nicely shaded, and heavily coated with nutritious grasses and herbage. The whole area is fattening and good breeding country, and is watered from natural and artificial supplies, including an artesian bore. Other improvements are fencing and dams.

Free lithographs and full particulars may be obtained from the Land Agent, Charleville, the Land Settlement Inquiry Office, Brisbane, and the Government Intelligence and Tourist Bureau, Sydney.

General Notes.

Staff Changes and Appointments.

Mr. G. S. C. Birkbeck, Slaughtering Inspector, will be transferred from Gympie to Toowoomba, and Mr. J. R. Canty, Slaughtering Inspector, from Toowomba to Innisfail.

Mr. A. F. Moodie (Inspector of Stock, Julia Creek) and Mr. R. W. Bambrick (Inspector of Stock, Toowoomba) have been appointed also Inspectors under the Brands Acts.

Captain Arthur Broadbent, of the Bowden Pearling Company, Thursday Island, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Messrs. C. A B. Kenyon, E. P. Foster, and B. H. Halliday, New South Wales Plants Diseases Inspectors, who are stationed near the Border, have been appointed Honorary Inspectors under the Queensland Diseases in Plants Acts.

Mr. G. R. Patten, Analyst in the Agricultural Chemical Laboratory, has been appointed to the position of Senior Analyst in that laboratory.

Mr. T. L. Edwards, of Lake Pleasant, Goovigen, has been appointed an Honorary Ranger under the Animals and Birds Acts.

Mr. P. E. Hockings, of Thursday Island, has been appointed an Honorary Ranger under the Animals and Birds Acts and the Native Plants Protection Act, and Mr. H. N. Hockings, of Thursday Island, has been appointed an Honorary Ranger under the Native Plants Protection Act.

Messrs. F. B. Coleman, R. A. Taylor, and F. P. Coleman, Officers of the Seeds, Stock Foods, Fertilizers, and Pest Destroyers Acts Branch of this Department, have been appointed also Inspectors under "*The Veterinary Medicines Act of* 1933."

Mr. J. R. Canty, Inspector of Slaughter-houses, Innisfail, has been appointed also an Inspector of Stock.

Mr. J. W. Winlaw, Inspector of Stock, Dairies, and Slaughter-houses, has been transferred from Zillmere to Gladstone.

Mr. D. C. Pryce, of Toogoolawah, has been appointed Chairman of the Queensland Cotton Board until the 31st December, 1935.

Pools—An Important Principle Reaffirmed.

The Minister for Agriculture and Stock, Mr. F. W. Bulcock, announced recently that he was in receipt of communications from chambers of commerce and wheat-growers relative to the action that had been taken in extending the date for lodgment of a petition for a ballot in respect of the continuance or otherwise of the operations of the pooling system as applied to wheat. It is the case that an extension of time for a further fourteen days for the presentation of a petition to be signed by 500 wheatgrowers was asked for and granted. It was realised by him that the prevalence of rain on the Downs preceding the original date for presentation of a petition had added to the difficulty of obtaining the requisite number of signatures of growers demanding a ballot. The principal reason for his decision, however, rested in the fact that it had ever been the policy of the Labour Government since the inception of the pooling system, to allow the majority of growers an opportunity to decide whether or not they desired to adopt the pooling system in respect of their particular industry, and on no occasion had the Labour Government attempted to impose the pooling system of marketing upon the growers of a primary product.

This principle, he contended, was major in comparison to the issue that had been raised by the various bodies, and it was one that should be rigidly maintained, even should its observance be found adverse to some other minor interest of those concerned. The necessary action to extend the life of the Pool had been taken in accordance with the provisions contained in "*The Wheat Pools Act of* 1920 *to* 1930," and the guidance of the Crown Law Department had been obtained where necessary. In the interests of the pooling system generally, it was necessary that every facility should be afforded to the growers of the commodity to indicate their desire to have a Pool extended or otherwise, and it was difficult to conceive that the interests of growers would be disadvantaged to any material degree while this principle was applied. The operations of the former Pool extended until such time as the wheat harvested in the 1932-33 season had been disposed of, and it was somewhat significant to note that no request for the extension of the Pool was lodged by the Wheat Board during 1933.

Public Service—Its Zeal and Integrity.

Following is a reprint of a leading article in "The Courier-Mail," Brisbane's morning daily, of 12th February, 1934:—

The Government's decision to reappoint Mr. J. D. Story as Public Service Commissioner for a further term of three years should be welcomed by every one who knows anything of the services that Mr. Story has rendered to the State of Queensland. Mr. Story will reach the age of sixty-five years in August next, but under the Public Service Act he may be reappointed by the Governor in Council until he reaches the age of seventy. His long career in the Department of Public Instruction has caused some people to regard him as purely an educationist, but he has given to successive Governments sound constructive advice on various other subjects with which he is well acquainted, and his annual reports have contained valuable comment on matters affecting the progress of the community. It was as a result of a visit that Mr. Story paid to America that the State's commodity pool legislation was introduced, and whatever individual opinion may be with respect to the wisdom of such legislation there will be no division of opinion about Mr. Story's activity and zeal on behalf of the State. It is a good thing for a community when its public service includes officers of Mr. Story's type. They are indeed the officers who have made the British Civil Service in all countries the fine thing it is. The civil service (or public service) is the foundaton upon which Parliamentary government rests; and, in the main, the officials are imbued with the highest traditions of conduct and of honour, and are animated with a high spirit of responsibility and of duty. No matter what political party is in power, Ministers know that the advice tendered by the permanent heads in the Government departments is the result of long experience and an earnest desire for the prosperity of the country.

Queensland is remarkably fortunate in its public service. It includes men who might easily have been more prosperous if they had given their attention to commerce or practised a profession. If the general work of the Queensland public service be considered dispassionately the observer will note, first of all, that the great machine runs smoothly, and that that part of the public which has to do with Government departments usually has very little cause for complaint. There must be a certain amount of routine in Government departments, and it is this routine which sometimes causes complaints. There may be an inclination on the part of some public servants to be a little too strict in the readings of Acts of Parliament, and that also causes discontent. But, taken generally, the public service of Queensland is actuated by a desire to help the community, and does render it very valuable aid.

The blue ribbons of the public service cannot be for every civil servant. Some attempt has been made to open wider the avenues to those ribbons by what is known as the age-limit rule; but, however popular this may be, the community in many cases would suffer if all public servants were compelled to retire at the age of sixty-five years. The experience which some civil servants gain is of great value to the State. Some work cannot be performed at all without a long experience; and it seems to be unreasonable that just when a man is really at his best he should be compelled to retire. It is pleasing to note that the record of many an officer in the Queensland public service shows that there is both zeal and efficiency in the service. There is also a great pride in the service on the part of those within it, and when the variety of duties which public servants are called upon to perform for the community is considered there can be no doubt of the ability displayed. Fears have been expressed that there has been a weakening of loyalty because of the regulation allowing public servants to take a more active part in politics than formerly they were; but while that possibly applies to a few it must be admitted that the great majority of officials give equally loyal service to whatever Government is in power.

The Dairy Products Stabilisation Act.

By Proclamation issued under the Dairy Products Stabilisation Act, the 8th February, 1934, was appointed the day for that Act to be brought into operation. An Order in Council made under the same Act provides that the members of the Butter Board and two members of the Cheese Board shall constitute the Dairy Products Stabilisation Board for a period of one year from the 8th February, 1934. The present members of the Butter Board are Messrs. W. J. Sloan (Malanda), R. M. Hill (Bororen), J. McRobert (Maryborough), J. Purcell (Toowoomba), T. F. Plunkett, M.L.A. (Beaudesert), A. G. Muller (Fassifern Valley, Kalbar), and E. Graham (Director of Marketing). The two members of the Cheese Board appointed to the Board are Messrs. H. T. Anderson (Biddeston) and A. J. Harvey (Pittsworth).

"The Veterinary Medicines Act of 1933."

The Veterinary Medicines Act came into force on 8th February. Regulations to give effect to the provisions of the Act have received the approval of the Executive Council, and a Veterinary Medicines Board, consisting of Messrs. E. H. Gurney (Agricultural Chemist), A. H. Cory (Chief Inspector of Stock), St. G. Thorn (Bacteriologist), and J. A. Rudd (Director of the Animal Health Station and Government Veterinary Surgeon) has been constituted. Mr. W. G. McKechnie (Analyst in the Department of Agriculture and Stock) has also been appointed Analyst under the Veterinary Medicines Act.

Annual Carcass Competition—Export Porkers—Special Conditions.

Attention is drawn to the holding of annual carcass competitions by the Queensland Meat Industry Board, the first of which is to be held on the 31st May, 1934, at the Brisbane Abattoir. These competitions provide for beef, lamb, and pork carcasses suitable for the export trade, and should attract considerable attention and be productive of much good to live stock interests in this State.

In class "C" provision is made for six carcasses of pork, dressed weight 60 to 80 lb., first prize £15, second prize £10, and third prize £5. Entries must be made in respect of ten pigs and must be on the form provided for that purpose by the Queensland Meat Industry Board, and must be lodged not less than fourteen days before date on which the competition will be held. A separate entry must be lodged with each exhibit, each exhibitor being allowed no more than two entries. There will be no charge for lodgment of entries.

From each exhibit of ten pigs there will be selected the best six carcasses for the purpose of the competition. If any person lodges two entries in any one class, the animals comprised in each entry must be so marked as to be easily distinguishable from the animals in the other entry. All such marks must be shown on entry form.

All pigs exhibited must be bred and fattened in Queensland, and must have been the bona fide property of the exhibitor for the three calendar months prior to date of lodging the entry. All pigs exhibited must be consigned to the owner's selling brokers and placed by them in their allotted pens at the saleyards, Cannon Hill, and sold by public auction on Monday, 28th May, 1934. All pigs will be exhibited at owner's risk, and while in the saleyards will be subject to the usual saleyards conditions. Each exhibit shall be offered for sale as one lot, and the splitting of any exhibit between purchasers shall not be allowed.

Pigs exhibited will be taken delivery of by the Queensland Meat Industry Board immediately after sale, and on no account will any animal be removed from the Board's pig pens. All pigs exhibited will be slaughtered and dressed on Wednesday, 30th May, 1934, and card showing the dressed weight will be placed on each carcass. The Board reserves the right to cut any exhibit of pork into such portions as it so desires, and will be prepared to purchase at the original purchase price any carcass which has been so cut. The pork exhibited shall be delivered to the purchasers of the live stock on the morning of Friday, 1st June, 1934.

In the pork competition the judge must reject any carcass which is below the stipulated minimum weight, but may allow in the exhibit any carcass over the stipulated maximum weight, provided that the average of the six carcasses in the exhibit does not exceed the stipulated maximum weight. The judges shall not award any prize unless they deem the exhibit for such prize to have sufficient merit. A standard scale of points has been decided upon, and a copy of the completed scale will be sent to each exhibitor, who will thus be able to detect his faults by the number of marks in relation to the maximum.

Any further information required may be obtained from the Secretary, Queensland Meat Industry Board, Cannon Hill, Queensland.

Prohibition of Removal of Sugar-cane Plants from Kalkie District.

A Proclamation, made in pursuance of the provisions of "*The Diseases in Plants Acts*, 1929 *to* 1930," prohibiting the removal of sugar-cane plants, for any purpose other than to be milled at Millaquin sugar mill, from the quarantine area embraced in that portion of the Kalkie district described below, has received Executive approval. This quarantine area has been declared owing to the prevalence of Fiji disease of sugar-cane, and it may be described as being the area of land bounded by the Back Ashfield road on the south, the Ashfield road, and thence a line drawn in continuation to the Burnett River on the east, the Burnett River on the north, and the boundary of the city of Bundaberg on the west. The removal of sugar-cane plants from this area is prohibited, unless a permit in writing shall have been first granted by an inspector in the prescribed form.

Rural Topics.

Maize versus Sorghum as Silage.

Saccaline sorghum has become very popular with dairy farmers as a silage crop; so much so, in fact, that several delegates to the recent Upper North Coast (New South Wales) Agricultural Bureau Conference expressed surprise that maize should be considered by anyone as being superior to saccaline for silage making. Officers of the Department of Agriculture of New South Wales, however, have always claimed that maize is a better silage crop than sorghum, being less subject to disease and producing fodder of higher feeding quality.

In the coastal fodder conservation championships of past years, practically every competitor has favoured maize silage. Commenting on this point the Chief Instructor of Agriculture (New South Wales), who judges these championship competitions, explained that maize excels all other fodder crops in the total nutrients produced per acre. On the poorer soils, however, sorghum yielded better than maize.

Writing on the subject of suitable silage crops, the Senior Agricultural Instructor stationed on the North Coast (New South Wales) says: "Maize makes the best silage. It is bulky, produces a heavy tonnage per acre, and retains its moisture well. Generally speaking, it is at its best stage for cutting when the grains cut like cheese, which is approximately three weeks later than the roaster stage. It has been found, however, that sappy stalks lend themselves better to packing and compressing in a trench silo (very dry and pithy stalks should always be avoided); and it is therefore not always advisable to wait for the grain to become cheesy. In this connection some discretion should be used.

"It sometimes happens that farmers' crops are of different ages—one patch ready for silage and the other immature. It is preferable to allow the latter to mature nearly to the correct stage, provided, of course, the earlier crop does not lose too much of its succulence. The ripest maize should be pitted first. Good maize silage should have a fairly high percentage of cobs scattered through it.

"Sorghum, cut between the flowering and firm seed stages, has become a very popular crop for silage. Because of its drought-resistant capacity it does well on second-class soils."

Crutching of Sheep.

Crutching usually takes place about midway between shearings, and is therefore considered to be of some value as a preventive of blowfly infestation, as the fly does not operate so freely when the wool is short. With ewes in lamb crutching is usually performed about six weeks before lambing, the object being to clear away all wool from the hindquarters and over the udder, so that at lambing time there will be less attraction for the blowfly, and in order to make it easier for the young lamb when suckling its mother.

Maiden ewes and ewe weaners also require careful crutching, and the whole ewe portion of the flock is usually crutched at the one time. The crutching of ewes should extend well above the tail, taking in all the inner britch and, as stated above, in the case of lambing ewes, the area close to the udder.

Unless the fly is particularly bad, the only time it is necessary to crutch the wethers is when, owing to change of feed or other causes, they become scoured, in which case the soiled wool should be removed. When crutching wethers, therefore, only the wool immediately below the tail will be removed, apart from the usual "ringing."

All sheep which are heavily woolled on the head should at this time be wigged. If this is neglected, such sheep become wool-blind, and, being unable to find their way to the water, fall away in condition and sometimes die. There is greater danger also of grass-seed entering the eye when a sheep is very woolly on the face.

Some sheepowners do not consider crutching necessary, but because of the cleaner appearance of the sheep and the absence of trouble with daggy wool at shearing, the operation is recommended, even though the fly may not be active.—A. and P. Notes, New South Wales Department of Agriculture.

Better Export Lambs—Competitions among Breeders.

Not more than 25 per cent. of the lambs sold at Homebush saleyards are the ideal export type. Such a state of affairs makes it difficult for this State to compete overseas in the fat-lamb trade. With the idea of bringing before fat lamb breeders their shortcomings and of affording them an opportunity to learn how best to improve their methods, Export-Lamb Breeders' Competitions were inaugurated last season. These, taken in conjunction with the Royal Agricultural Society's Export Lamb Carcass Competition, should do much to raise the present standard of our export lambs.

Practically every export lamb producing district in the State was represented in the competition, and almost every breed at all popular in New South Wales for lamb production was entered. Local competitions were held in most districts, and many of the benefits of these competitions are gained by breeders accompanying the judges during their inspections of the different flocks, when the defects of the animals are pointed out and suggestions offered for their improvement.

Generally speaking, the standard of the lambs exhibited was very good. The first eight teams were particularly good, and in the opinion of the judge (the Senior Sheep and Wool Instructor of the Department of Agriculture) they indicated that our breeders can, with correct methods, produce lambs equal to any in the world. The objective of all other breeders should be to attain as high a standard as the most successful exhibitors in the competition. A comparison of monetary returns would readily prove that any added work and expense along these lines would pay handsomely.

The winning entry was that of Mr. H. S. Henley, "Basset Downs," Cowra, Mr. W. McSweeney, "The Rivers," Canowindra, and Mr. B. J. Stocks, "Linden Hills," Cunningar, occupying second and third places respectively.—A. and P. Notes, N.S.W. Dept. of Agric.

Destruction of Summer Weeds.

The most economical method of destroying summer growing weeds is by harrowing when the weeds are at a very young stage, but owing to the protracted nature of the harvest due to frequent rains, most farmers were obliged to concentrate all available power and labour on harvesting operations when the weather was suitable, and the fallows had to be neglected. With the completion of harvesting, however, there should be no delay in cultivating fallows to destroy the weeds, for they should not be allowed to flourish any longer than can be avoided, as they are continually pumping up moisture from the soil and utilising plant food, thus nullifying the work that has already been done in fallowing the land. Furthermore, if the weeds are not destroyed without delay they will foul the land with their seeds, and if the cultivation is left till near the sowing period the undecomposed plants will prove a hindrance to the satisfactory sowing of the wheat.

The best implement for destroying a heavy growth of weeds is the disc cultivator. Under normal conditions the use of this implement has a damaging effect on the fallow by disturbing the compacted seed-bed, especially if the working is performed near the sowing period. If, however, the disc cultivation is carried out at the present time, particularly in the later districts, there is a reasonable probability, judging by the nature of the season, that sufficient rain will fall subsequently to restore the compactness of the seed-bed before sowing.

The rigid-tined cultivator, when fitted with wide shares, is also effective in destroying weeds, but in the event of rain falling shortly after the cultivation there is a greater risk of a proportion of the weeds taking root again.—A. and P. Notes, New South Wales Department of Agriculture.

A Point in Milking.

Most of the troubles in milk and cream are caused by organisms closely associated with cow manure. Milk in the udder of a healthy cow in normal condition is practically free from bacteria, but directly it is drawn from the cow by ordinary methods of milking it may contain many thousands of bacteria per cubic centimetre. The first point of infection is the teat. Cows lying down will often squeeze out a drop of milk, which becomes infected with bacteria from the ground. These work up through the teat canal and multiply rapidly.

Thus the first milk drawn from the cow generally contains large numbers of objectionable organisms, and dairymen are well advised to discard the first few squirts of milk as drawn. Practically nothing is lost in doing so, as it has been definitely proved that this first milk contains practically no butter-fat.

The Export Trade in Pig Products.

At the recent annual meeting of the North Canterbury Co-operative Sheep Farmers' Freezing Company (New Zealand), the chairman, Mr. J. H. Blackwell, had this to say:—

The attention of producers can, with advantage, be given to developments now taking place in the pig export business. Hitherto this has been almost negligible as far as New Zealand is concerned, and for the five years ended 1932 the annual export of pork carcasses ranged from 130,000 to 150,000. The season just ended, however, shows a marked increase to 310,000, a jump of over 100 per cent. in one season.

One of the most striking features of the United Kingdom meat market was the tremendous increase in supplies of foreign bacon imports between 1929 and 1931. In two years these imports rose from 8,250,000 cwt. to over 11,000,000 cwt., or by 33⅓ per cent. This increase alone—2,750,000 cwt.—is estimated to be equivalent in weight to the whole of the lamb imported into Great Britain in 1931. This was one of the greatest factors in depressing the price of lamb, and received especial attention by our representatives at Ottawa.

Great Britain has promoted legislation to restrict foreign imports of bacon, while the Ottawa agreements contain provision for expansion of the New Zealand pig export industry. So far New Zealand has failed to secure anything more than a fraction of this vast market, but has, at any rate, shown that the Dominion can breed and fatten and export the right class of pork. In the South Island hitherto little interest has been taken in the matter of pork export, the proportion of output of 310,000 carcasses this year being:—North Island, 98½ per cent.; South Island, 1½ per cent.

To Maintain Egg Production.

In view of the low return for eggs, it is essential that the greatest care be exercised in the management of the pullets and laying stock generally in order to maintain production at the highest possible level. It is at this time of the year that the careful and skilful poultry farmer reaps the reward of his labours (writes the Assistant Poultry Expert of the Department of Agriculture in current notes). During the flush season a little lack of attention or mismanagement may not have any serious consequences, but from now till next spring no liberties can be taken without the risk of seriously affecting the egg yield.

As far as the young stock are concerned, the main essential is to prevent any crowding, particularly among the later birds, but the mistake should not be made of thinking that the early pullets can be housed in large numbers with impunity. This error, it is not fully realised, leads to much trouble. For instance, such conditions often result in the early moulting of pullets. Again, an early outbreak of chicken-pox is frequently the outcome of unduly crowding the young stock.

On farms where the accommodation does not permit of spreading out the young stock, the best course would be to reduce the second-year hens as much as possible by marketing those which appear unlikely to continue laying through the off season, or to erect some cheap temporary shelter and run to accommodate them, thus making other pens available for the new season's birds.

Correct feeding is another important factor influencing egg production, and this applies not only to the class of feed given, but also to the manner in which it is fed to the birds. The latter calls for much closer attention at this time of the year than it is often given, and a little extra time spent on this work would be amply repaid.

Too often one sees the feed hurriedly thrown to the birds, as if feeding were a task to be got through as quickly as possible. The skilful feeder does not rush operations. He puts down a certain quantity of food, and then stands by for a few moments to gauge the appetites of the birds, and if they show keenness (but not otherwise) gives more food; or he gives the feed all round and then returns to see if more is required. This method should be adopted at both the morning and evening feeding where the wet mash system is employed, the art of feeding being to give just as much as the birds will eat at each feeding time without having any food lying about. In some instances where dry mash is used a partial feed of wet mash is given during the day, and in such cases care is necessary not to feed too heavily with the wet mash, because this will result in the birds becoming surfeited, and thus bring about an unhealthy condition.

Udder Wounds and Treatment.

Such injuries to the udder of the dairy cow as those caused by blows, hornings, kicks, treads, barbed wire cuts, &c., may not only result in an inflammatory condition of themselves, but may also serve as portals for various specific infections. It is all the more important, therefore, that the injuries should not be neglected.

All dirt and foreign matter should first be removed by careful washing of the part with a weak solution of antiseptic (2 per cent. lysol or similar disinfectant). When cleansed, surface injuries may be dusted twice daily with an astringent such as zinc and starch powder. No further washing should be carried out unless there is considerable discharge. Sometimes pus forming organisms gain entrance to udder injuries, especially if the wounds extend beneath the skin into the udder tissue. Under suitable treatment these wounds will heal, but frequently, in spite of apparent healing, the organisms remain and later set up mammitis.

Injuries to the udders of cows in full milk are often troublesome, since the milk is constantly leaking on the wound and healing is thus retarded. In spite of any treatment that can be adopted by the farmer, such wounds frequently fail to close completely, there being left a small opening through which milk constantly leaks. This type of wound is not uncommon after injuries to the teats, and surgical measures are necessary to remedy the condition.

The general principles to be followed in the treatment of injuries which penetrate more deeply than through the skin are:—

Cleansing of the wound as soon as possible with weak antiseptic solution.

Removal of all torn shreds or loose pieces of tissue with a sharp pair of scissors, which have been boiled immediately prior to use.

Suturing of the wound with sterile (boiled) thread and needle. (This is best carried out by a veterinary surgeon.)

The protection of the wound from further infection by use of an antiseptic dusting powder applied at frequent intervals, or by the frequent application of an astringent solution, such as white lotion made up with the following:—

Sulphate of zinc, ¾ oz.
Acetate of lead, 1 oz.
Water (boiled), 1 pint.

A white deposit will form in the bottle when it is allowed to stand. The bottle must be well shaken before the liquid is used. For safety the bottle should be labelled "Poison."

If the wound shows much swelling, intense redness and discharge of pus, frequent irrigation will be necessary to keep it clean. Such irrigation should be carried out with any weak disinfectant solution, but permanganate of potash solution, peroxide of hydrogen, or hypochlorite solution are especially useful.

In all cases of udder injury the wound should be protected from flies and dust as far as possible. Hence cows should be kept in a small, clean paddock close to the dairy, and the wound covered lightly with clean gauze, kept in place with adhesive tape, or the udder covered with a suspensory bandage.

Should the wound heal but leave an opening through which the milk leaks, no attempt at treatment should be made by the farmer. The case is one that should have the attention of a qualified veterinarian.—A. and P. Notes, New South Wales Department of Agriculture.

Load Pigs on One Deck Only.

The North Queensland Co-operative Bacon Association draws attention to increased freight rates charged on pig wagons despatched from country stations to factories, and mentions a typical case as follows:—Pig growers are requested to load the bottom tier of pig wagons to maximum capacity before placing pigs on the top tier, thus utilising the whole truck instead of half truck, when number forwarded only warrants half truck. This additional care in loading enables the factory to minimise freight charges. Recently the factory ordered one tier of a pig wagon, and provision was thereby made for loading of up to twenty-five bacon pigs at a freight charge for half wagon of £1 4s. Actually, eighteen pigs only were loaded, some being placed in the top and some in the bottom tier, and this resulted in factory being charged an additional £1 4s. for freight, or £2 8s. for full wagon, whereas the number of pigs sent in was less than that required for one tier only.

It is in matters like this that farmers and trucking agents can do much to assist in reducing manufacturing costs and assisting to make the pig industry a more profitable one.

Green Manuring.

Green manuring benefits the soil in two ways. It enriches the soil, in the first place, by supplying it with a considerable amount of readily available plant-food, and in the second place, by adding humus, and thus improving the soil's texture and its power of absorbing and retaining moisture. When a manure crop is buried, the surface soil becomes enriched by the nourishing materials which the crop during the period of its growth has drawn from the air and from the lower portions of the subsoil, and this material is now placed within the reach of the succeeding crop.

During the growth of the plant the soil has, in addition, been stirred up and disintegrated by the development of the roots. When ploughed under, provided sufficient moisture and warmth are present, the buried mass decomposes with more or less rapidity.

A further important result is the formation of carbonic acid by the decomposition of the buried crop. Carbonic acid is given off abundantly in the fermentation of the mass, and assists in the disintegration of the soil and in rendering available the plant food contained in it.

With regard to the kind of crop to be used for the purpose of green manuring, a good deal of latitude is permissible. Any crop that is rapid and luxuriant in growth, and that can be readily turned under, is suitable for the purpose, and the selection will be guided by considerations such as the time of year at which it is to be grown, its suitability to soil and district, &c. Among the most effective crops for the purpose are leguminous plants, such as clover, velvet beans, peas, &c., since these are specially valuable on account of their power of obtaining their nitrogen from the air. They are, therefore, specially suitable for soils poor in nitrogen, and are of high value in enriching the soil with this ingredient.

It is a not uncommon fallacy that if a leguminous crop is removed from the land and the roots with their nodules remain, the soil is thereby enriched in nitrogen. The nitrogen taken from the air by legumes in association with certain bacteria in the soil does not, however, exist in the nodules, but is made use of and distributed throughout the plant, and the removal of the above ground portion of the plant from the land therefore means the removal of a large amount of nitrogen. An increase in the nitrogen content of the soil can only result from the growing of leguminous crops when they are ploughed in, or when they are fed off or soiled to stock, and the resultant manure from the stock is returned to the soil.—A. and P. Notes, New South Wales Department of Agriculture.

English Carcass Competition -Large and Middle White Pigs.

There were ninety-nine entries in the pig carcass classes at the 1933 Smithfield Meat Show, London. The judges, after very careful inspection, awarded thirty five prizes and commended cards, and of this number no fewer than thirty one went to carcasses of British breeds, under the control of the National Pig Breeders' Association.

In the first class—one pig above 70 lb. but not exceeding 100 lb. live weight—the Middle White secured four award cards consisting of reserve, third, and two highly commendeds. The awards to Large White and Large White crosses in this class included first and reserve for the porker championship, second (a Tamworth Large White cross), and fourth (Large White Berkshire cross). Two of the three purebred Large Whites entered were highly commended.

In the 100 to 160 lb. class, sixteen out of eighteen prizes were awarded to N.P.B.A. breeds. Four of these went to Large Whites, including first and champion porker and supreme carcass of the show, reserve, and two highly commendeds. Two Middle White entries were awarded H.C., and two Berkshire-Large White crosses were awarded second and highly commended respectively, and a Berkshire was awarded fourth.

Of the five prize cards awarded in the bacon pig class, all were to pigs of the N.P.B.A. breeds or crosses. Large Whites figures in all awards—purebreds to win the third and fourth prizes, and as the top cross in the case of the first and reserve championship, the second and the reserve exhibits.

The Large White breed, which secured the cup for the best pig carcass, previously won the supreme championship in 1928. Since that year the cup has been won once by the Berkshire breed, twice by the Large White-Middle White cross, once by the Large White Large Black cross, and twice by purebred Large Whites.

Since 1928, when championships were introduced for the best carcasses in the two porker classes, Large White and Middle White crosses have won three times, Large White once, Berkshire once, and Middle White once.

The bacon pig championship has been won four times by the purebred Large White, once by a Tamworth-Berkshire, once by a Middle White-Large Black, and once by the Large White-Large Black cross.

Rapid Growth in Pigs.

From figures compiled recently in England relating to the average daily gain of pigs in the live stock classes at the Smithfield Show, London, it appears that the Large White breed made the highest breed gain—1.34 lb. per day, as compared with 1.12 lb., the aggregate gain of all pigs in the show. Since 1927 the championship for live pigs not exceeding five months has been won twice by Large Whites and once each by the Middle White, large White-Middle White, Middle-White-Large White, and the Essex breeds, respectively.

The championship for pigs above five months has been won five times by the purebred Large Whites and once by the Large White-Middle Whites in the past six years. The white breeds maintain their popularity in spite of keen competition of black and red breeds and of crosses of these popular types.

Agriculture in Japan—The Farmer the Burden Bearer.

In a description of Japanese life by an Australian observer (A. M. Richards, M.A.) in the "Sydney Morning Herald" of 19th February, occurs these interesting remarks:—

Contrast, however, the state of Japanese agriculture and the lot of the peasant. Japan is only the size (approximately) of New Zealand. In the mere 20 per cent. of that area in which agriculture is possible live 27,000,000 peasants. Farms range in size from about 1 acre to 3½ acres—2½ acres being the average. The Christian movement in Japan has bettered conditions enormously in some areas by its organisation of co-operatives. But they cannot radically alter the whole position, which is dependent upon the huge debt, estimated at 6,000,000,000 yen, which Japanese agriculture as a whole owes to Japanese finance. Sesumi, in his authoritative book on "Modern Japan," quotes cases where the whole rice harvest of farms has been sequestrated to pay the interest account, leaving the family to subsist on the "extras"—eggs, vegetables, &c.

Cheap food allied to simplicity of living makes possible Japan's unique combination of low industrial wages with high industrial efficiency. The peasants' hard wrung yen swells Japanese capital (through his indebtedness to financial magnates and institutions). And he is, in the last resort, the source of revenue for national expansion, both mercantile and military.

It has always been the policy of modern Japan to foster export industries at the expense of the whole nation. Economic planning is nothing new in the land of the rising sun. While still a medieval, feudal land, the ultra modern policy of systematic crop destruction was a recognised method of intra national economic control. Then, when the restoration of 1868 put into control of the national destinies an Emperor and supporters determined on a complete modernisation of political and economic life within their own lifetimes, a scheme of development—a fifty years' plan as it were—was laid down for the mobilisation of the whole national resources to that end. Individual enterprise was left to fill in the outline of the plan. But when individual enterprise needed assistance to complete its own small corner it always got it. "Industrial feudalism" would well describe this system of State-initiated and (in cases of need) State subsidised industry and commerce at its inception. To-day no great changes would be needed to transform it into full-fledged "intra-national socialism." A "laissez faire" stage Japan has never had.

During the last few years, however, Japan has found herself in a desperate economic situation. Industrialisation has naturally created a large population dependent for its very existence on the margin of profit between "raw" imports and manufactured exports. But when "American prosperity" collapsed, the silk export trade collapsed with it. China and India raised their tariffs against Japanese cotton goods. Resistance to penetration in Asia was renewed in the form of boycotts, which damaged exports and led to the expense of a considerable war. Finally, Great Britain's abandonment of the gold standard robbed Japan of some of the competitive advantages she had long enjoyed, just at a period when she was suffering from the adjustments consequent upon her own return to gold. Hence the present determination to sell at almost any price, even if it can be done only at the cost of still further suffering to the peasant.

Not low wages, therefore, nor industrial efficiency, though both count, but simplicity of life and a nationally controlled economy operating at the expense of the peasant is the secret of Japan's ability to undersell the world. Her almost desperate position in the world depression creates the necessity for doing so.

A Primary Producers' Secretary.

The attributes of a competent secretary of a primary producers' organisation are discussed in the following extract from an article in "The Producers' Review" (Toowoomba) for January:—

A primary producers' organisation must have for its objective something above mere mercenary gain. The soul and spirit of farmer-organisation should be the appreciation and realisation of the fact that all primary producers belong to one family and that their interests are mutual, and one of the chief objectives of the organisation of any particular section of primary producers should be to eventually weld together in one big union all primary producers. This being so, what, then, should be the calibre and attributes of a primary producers' organising secretary?

First of all, he must be one of themselves; in other words, he must understand their outlook on life; he must understand and sympathise with that spirit of independence in the farmer and his wife that drives them on to the selection in its virgin state with no other assets than stout hearts and strong arms and the dream of a "home of our own." He must be possessed of a dynamic force that is the driving-power of his particular section of his organisation. He must "think" but not "act" for his executive bodies—the latter is their duty.

A primary producers' secretary is in a totally different category to that of a secretary of a business firm. A mere recorder of minutes is totally unfitted as an organising secretary of a primary producers' organisation. A primary producers' organising secretary must have initiative, originality, constructive ability, and sufficient moral courage to stand for the ideals of farmers' organisation in spite of the effect it may have upon his own position.

The ideal farmers' secretary must understand that something in the makeup of the true farmer which abhors the name of master; that something which impels him to till the soil not altogether for the sordid desire of money-making, but the love to "plough and to sow, to reap and to mow," the keen interest in watching things grow, the love of producing with his own hands, the realisation that by the application of his own labour to the soil he has created something. The joy of his life has been reducing the soil to the finest tilth and planting it, realising that if nature smiles on him he will be rewarded for his labour as far as an abundant crop is concerned. But, alas! nature is not kind. Adverse seasonal conditions begin to cause heartache and disappointment. The ideal secretary must understand these joys and sorrows. They must be in his blood, otherwise he can never accomplish anything of real worth where the primary producer is concerned.

Such a secretary must feel that he is working, not merely for the purpose of holding down his job, but for the common weal. The true secretary of agricultural movements would not waste his time on the job if he were not accomplishing something; assisting to educate those whom he represents; ever aiming at a gaol, no matter how far distant its accomplishment may be. No matter how much he realises that it will not be accomplished in his time, he must fight on, with others, in blazing the track. The mere routine secretary, who is happy wound up in red tape or is content to be just a rubber stamp for those who employ him, is of no value in any producers' organisation. Those who run may read, and he is certainly dull of comprehension who does not see in the signs of the times a world-wide organisation of production and distribution. Australia—Queensland in particular—is leading the world in this particular direction with its agricultural machinery.

Throughout the world we hear the murmur of discontent from primary producers. To-day it is a small cloud on the horizon; to-morrow it will be an irresistible storm. The time has long passed when the primary producer should remain the bottom dog. But he does little or nothing principally because he has not the right men to drive him into action. These men are certainly hard to find; they are not born, but made —made through the hard school of practical experience in the first instance; made by the gift of vision and ideals. It is time that primary producers started to produce something besides commodities. They should produce organising secretaries by finding the men in the making, because they will be wanted if primary producers are ever to come into their own. Men are wanted who are not job-hunters, but men who know the potential strength of their own farming community and are prepared to devote a lifetime to developing it.

Only a Good Sow is Worth Keeping.

Seeing that it costs no more to keep a good sow than a bad one, it is obvious that a bad sow must be a money-loser all the time. The bad sow, no matter what her pedigree, is the one which does not do well for her owner, or, in other words, does not achieve what may be considered average results.

The average sow, so far as breeding capacity goes, may be considered capable of performing her duties for at least four or five years, though there are some that will remain profitable much longer than that. If a sow that has been hitherto satisfactory shows a decided falling-off after her first two or three litters, then she should be scrapped forthwith and replaced by another.

It should be borne in mind, however, that the fault sometimes lies with the boar. A change of boar will often work wonders in the herd, and this is a point that must be constantly watched. Many a sow has been blamed for producing small or weakly litters, when all the time it was not her fault at all. When a sow, which is otherwise good and has done well in the past, suddenly fails to maintain her reputation, the possibility of the boar being at fault should never be overlooked.

No sow which does not prove herself to be a good mother is worth keeping. Her performance with her first litter, however, does not necessarily prove her abilities in any direction. If she be a well-bred sow, or with such good points about her that she seems worth keeping, then she should certainly have a second chance, even though she has made a mess of her first attempt. It often happens that a maiden sow which produces a small or poor litter does very much better with her second lot, and will continue to do well subsequently. There may be many reasons why a young sow should fail in the beginning—one of them may be the attempt to breed from her too soon. In most cases it is wiser to wait until a sow is at least ten months' old before allowing her to breed.

Something must be added as to the importance of giving a sow every chance to do her best. No sow can show good results if she be improperly fed, roughly handled, badly housed, or subjected to undue interference at critical times. When failures occur, every pig-breeder should ask himself whether it is really the sow that is solely to blame, or whether there may not have been some contributory cause. In such cases, if there be any doubt, the sow should have the benefit of it; if there be no doubt at all, then the sooner she is fattened off and got rid of the better.—"The New Zealand Farmer."

Large or Small Litters?

One has heard it said before now that big litters are not altogether desirable, the argument against too great fecundity in the sow being that when there are many the pigs can never be so good as when the family consists of a more reasonable number. It is also argued that a sow which produces more pigs than she can comfortably rear, is wasting her substance to no good purpose.

But are these theories borne out in practice: If it were possible, one would, no doubt, regulate the size of the sow's litter on each occasion to the number of pigs that she was capable of rearing satisfactorily—say, eight to ten. But since we cannot do that, surely it is better that a sow should err on the side of extreme prolificacy than in the opposite direction. It is by no means certain that a sow, which produces twelve or more pigs at a time, is over-taxing her strength. If she be well fed and properly looked after she should be none the worse, though to let her try to rear more than ten would, in the majority of cases, be unwise. One hears sometimes of litters of extraordinary size—as many as eighteen or twenty. Obviously to let a sow try to rear so large a lot as that would end in disaster.

The chief advantage of large litters is that it allows a margin for those casualties which often occur. In a very large litter there were certain to be some pigs that are more or less worthless from the first. Such pigs can be sacrificed without any qualms. But even when the family is a large one it is a mistake to weed out any pig that seems to have a chance, until the danger period is over. As a general rule, this extends over the first three or four days after birth. If any pig succumbs from natural weakness or from some unnatural causes, the misfortune will probably occur within the period mentioned. After that one may use one's discretion in regard to the remainder. If there are still too many it may be advisable to scrap one or more of the worst specimens. Unfortunately, when accidents occur to small pigs soon after birth, it is often one or two of the best that are the victims, but that cannot be helped except so far as to take the usual precautions.—"The New Zealand Farmer."

When Cattle Judges Don't Agree.

Thus "Himi" in the "New Zealand Farmer":—"I can't see what he saw in that cow to place her first," said a rather celebrated breeder regarding the decision of an experienced judge at a recent show. It is curious how widely opinions differ. On the Island of Jersey it is generally the rule that a different set of judges is used for the championship awards, and this often causes a reversal of judgment. That is to say that a second, third, or even a fourth prize animal in a class may eventually win the championship. The explanation is that some judges may favour and give more points to vessels, for instance, whilst others may regard body formation or fineness of bone as a greater asset. "No udder, no cow," is generally considered sound opinion, but, of course, it is the finer points of distinction—those which determine between a nearly perfect and a perfect udder, a fine and a superfine bone, a really good body and a body that is better still—which raise the difficulties. And in assessing the value of one attribute as against another the real problem arises. The possession of a fine square bag running well under the body with beautifully placed teats, and showing no cut in the back of the bag, does not prove that the cow is a wonderful producer. This type of animal looks best when she is fresh. On the other hand a cow with a big, deep body, a straight top, pin bones placed high, good setting, with a head nicely dished and intelligent eyes, will look well the whole year through. But, as has already been suggested, it is in the nice and exact balancing of the various qualities that creates the difference of opinion so frequently observed in the show ring.

Silage—Useful Hints.

In an address on silos and silage at the recent Upper North Coast conference of the Agricultural Bureau of New South Wales, Mr. Alex. Smith, of Bandon Grove, gave a number of useful hints concerning a form of fodder conservation the advantages of which no dairy farmer can afford to overlook. With regard to the varying character of silage, it was stated that the British Ministry of Agriculture recognises four types—

(1) *Sweet Dark Brown Silage.*—Made when the material heats up too much and the temperature rises above 113 deg. Fahr. Factors contributing to this are a comparatively dry crop, either one that is dry from being mature, or from being allowed to dry somewhat after being cut. Such dry crops facilitate fermentation, both because they do not pack so tightly and thus allow air to penetrate the silo readily, and because the heat that is generated by fermentation has comparatively less moisture in the silage to heat, and, consequently, the temperature rises more.

(2) *Acid, Light brown or Yellow-brown Silage.*—When less air is allowed to intrude than above, and the material does not heat up so much, this type commonly occurs (temperature range 86 to 104 deg. Fahr.). As a rule there is not much juice expressed from the silage when this type is being made. Acid brown silage is commonly made in pit and trench silos. This silage has a yellow-brown colour, and an acid, though pleasant, smell, largely due to the presence of acetic acid, the yellowish types having the more pleasant smell. It is readily eaten by stock, which thrive upon it, and it is to be recommended. This is the most common form made, and it is much superior to the sweet dark-brown variety.

(3) *Green "Fruity" Silage.*—Usually this quality is only made by chance, and it is hard to control conditions so as to make it with certainty. It is made by rapidly building fresh, lush, leafy grass (temperature about 86 deg. Fahr., but no higher). This type has a green to olive-green colour, and a smell that is delicious —neither sweet nor sour—and is best described as "fresh" and "fruity." It is greedily eaten by stock, and it has recently been shown that its digestibility is very high. It has one disadvantage—much juice is lost.

(4) *Sour Silage.*—Sour silage has generally a dark-brown or olive-brown colour, and a pungent and very unpleasant smell, due largely to the presence of an acid. It is commonly made when a very immature and succulent crop is ensiled. In this case the watery fodder packs down very closely in the silo and excludes the air to such an extent that little heating is possible. Thus crops of immature maize often give rise to sour silage. Again, sour silage is frequently found at the bottom of trench silos—especially if the material has been carted in wet weather, because the trampling of horse and cart over the trench, as well as the super-imposed weight of silage squeezes out the air and limits fermentation. Such defects may be obviated and the sourness reduced if the making of the silage proceeds slowly so that a certain amount of heating may occur in each layer of 3 or 4 ft. before the next layer is put on. This sour silage has a high feeding value, and is quite palatable, despite its unpleasant smell.

The Home and the Garden.

OUR BABIES.

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of unnecessary deaths.

This article was published in New Zealand some years ago. It is so suitable to present Queensland conditions that we reproduce it.

MOTHERCRAFT AND THE TODDLER.

What do We Mean by "Mothercraft"?

BY "Mothercraft" we mean the simple science and the art of correct mothering. Does anyone murmur "the maternal instinct"; does anyone still pooh-pooh the idea of applying science to motherhood, saying, "The bird needs no science, nor the cat, a mammal like ourselves?" To such objectors, we would say, in the vivid words of Dr. C. W. Saleeby: "Just because the human mother is human her forte is not instinct, but intelligence. The insect, avian, and feline mother has instinct in various forms and degrees. The cat never gives her kittens 'the same as we have ourselves,' but her own breast. Within the limits set by a certain range of environment to which they are evolutionary adapted, sub-human mothers 'know' all they need to know—which is well, for they can scarcely learn. To learn is to be intelligent. The human mother is that; but intelligence, whilst it can learn everything, has everything to learn. That is why the sub-human mother (and father, of course), relying upon fixed, well-adapted, ready-made instinct, seems superior to ourselves, who make the most deplorable mistakes from the moment we begin. . . ."

Modern human mothering is an art, not an instinct—else why so many bottle-fed babies, when "the good God gives the milk with every mother?" Why so many delicate babies, dead babies? And why has the death-rate fallen and the standard of infant health risen in the community with the increasing application of rational, scientific principles to the feeding and rearing of babies?

The Mothercraft Ideal.

All over the world people are waking up to these facts, and are striving to achieve the mothercraft ideal, which aims at having every baby naturaly fed, and 100 per cent. healthy, happy, and good; every toddler and school child sturdy and robust; every boy and girl aware of the simple essentials for good parenthood—and so back to the beginning of the cycle again, with the mother, healthy and happy before and after birth of her baby, equipped to rear A1 citizens and to deal serenely and successfully with the dangers and difficulties which may come—in other words, to be "the competent executive in her own home."

A grand ideal for which to work! And how much, how very much, remains to be done, especially with regard to the health of the pre-school child and the teaching of simple mothercraft to school children.

The Health of the Pre-School Child.

We propose to elaborate somewhat on this aspect of the subject in a few forthcoming articles, feeling that it is one of the most urgent and important problems of the times.

Whilst it is true that our infantile mortality rate and the standard of health amongst our babies under one year is unequalled anywhere, it is too sadly true that this standard is by no means generally maintained through the later period from one to five years. The splendid babies of a year to eighteen months' old do not necessarily enter school in the "splendid" class.

The Tragedy of the Teeth.

School doctors and dentists tell a woeful tale of the teeth. The proportion of children in Queensland entering school with perfect, or even reasonably good, sets of teeth is shockingly small. We cannot be satisfied whilst this is the case.

Why do the Children Fall Off in Condition?

Speaking very generally, the babies up to twelve or eighteen months' old are "splendid" because the principles of good mothering are understood and applied to the upbringing of babies, at least in some degree, by the great majority of mothers throughout the country. Again speaking generally, the older children "fall off" because the importance to them of those same principles is not understood, and they are denied the advantages of some at least of the simple essentials for good health—studied diet, regular habits, ample sleep, &c.—which are generally conceded to be necessary during infancy.

Continuity.

As a matter of fact, of course, the life of the child cannot be split up into sections labelled "infancy," "pre-school age," &c. It begins at conception, and during the first nine months is bound up with the health and fitness of the mother, but throughout that period and the whole of infancy and childhood the health and well-being of the child is one problem, governed by the immutable laws of nature.

An Appeal.

There is no royal road to success and no short cut. But there are some first steps, which all can take. First we must frankly face the position and realise that we are not doing the best we can for the "little runabouts." The next step is to seek authoritative advice and conscientiously endeavour to understand and follow it.

We have appealed many times to mothers to bring the older children to the baby clinics at intervals throughout the pre-school period, and we appeal again. It is only by whole-hearted "getting together" on the part of both parents and nurses that the best results can be achieved. Then let us get together to remove this blot on our national record.

TOMATO JAM.

Wash and stem the tomatoes, place in cooking vessel, crush sufficient of the fruit to start boiling, and reduce the whole to pulp by boiling, say for half to three-quarters of an hour. Strain all the pulp through a ¼-inch mesh sieve and weigh. Add ¾ lb. sugar for each pound of pulp, and bring to the boil. The cooking time cannot be stated definitely, there being many influencing factors. Fast boiling for approximately an hour to an hour and a-quarter will produce the desired consistency.

As tomato jam made to this receipe is inclined to be insipid, the addition of a little acid in the form of citric or tartaric or pineapple, &c., is a decided improvement. The addition of acid should be done when the jam is about half cooked, and at the rate of 1 oz. to 25 lb. of pulp. Lemon juice may be substituted for tartaric, and if it is desired to use the whole lemons, they should be cut up into very thin slices and boiled for, say, half an hour before being added to the jam.

Apple pectin added to tomato jam has proved a decided success, supplying bulk, combination, and acid in one.

POINTS IN JAM-MAKING.

Use the best crystallised sugar.

The fruit should be sound and not too ripe.

Boil fast, as this preserves the colour and flavour.

Stir as little as possible, for stirring breaks up the fruit and renders it more liable to burn.

Make small quantities at a time; large quantities are not always a success.

Skim off impurities and do not use iron or tin preserving pans.

Use a wooden or an aluminium spoon for stirring.

Seal the jars down perfectly to keep airtight.

Store in a dry, dark pantry.

Orchard Notes for April.

THE COASTAL DISTRICTS.

IN the Orchard Notes for March the attention of citrus-growers was called to the necessity of their taking the greatest possible care in the gathering, handling, sweating, grading, and packing of the coming crop of fruit, as the returns for the labour expended in the upkeep of their orchards will depend entirely on the condition in which the fruit reaches the market. Many growers fail to realise the very important fact that the success of fruitgrowing does not depend merely on the proper working and management of the orchard, so essential for the production of a good crop of high-class fruit, but that the manner in which the fruit is handled and placed on the market is of even greater importance. In no branch of fruit culture is this more evident than in the case of citrus fruits, as no fruit pays better for the extra care and attention necessary to enable it to be marketed in the best possible condition. Every season there is more or less loss in the consignments sent to the Southern markets, the percentage depending mainly on the weather conditions, the loss in a wet year being much heavier than that in a dry year.

A very large percentage of the loss is due to what is known in the trade as specking—viz., a rotting of the fruit caused by a mould fungus—and this loss can be prevented, provided necessary precautions are taken. Although this matter was dealt with last month, it is of such vital importance to our citrus-growers that it is necessary to again refer to it.

In the first place, growers must clearly understand that specking cannot occur on perfect fruit, the skin of which is free from injury of any kind. The fungus causing specking can only obtain an entry into the fruit through an injury to the skin; it will thus be seen that the remedy for specking is to take every possible care not to injure the skin of the fruit in any way.

Few growers realise how easily the skin of citrus fruits is injured, especially that of fruit grown under moist and humid conditions, when the skin is full of moisture and so tender that the least sign of rough handling causes serious injury, as the cells of the skin are so brittle that they are easily broken, and when so broken a ready means of entry for the mould fungus is provided, and specking follows in due course.

The remedy for specking is in the hands of the grower, who must learn so to gather, handle, and transport the fruit from the orchard to the packing-shed that it does not receive the slightest injury, and further, that when it has reached the packing-shed it must be carefully placed in shallow bins or on trays and be exposed to the air for at least seven days, so that the surplus moisture in the skin may be removed, and the skin thus become toughened and less easily injured. This drying of the skin is known as "sweating," and during the time the fruit is being sweated it should be kept under observation, and all fruit showing signs of specking or injury from fruit flies, sucking or boring insects, mechanical injury or bruising, should be removed.

In order to prevent injuring the skin when gathering, all fruit must be cut and not pulled. Gloves should be used to handle the fruit, and when cut it should be placed in padded baskets or other suitable receptacles. Any fruit that falls or is injured in any way should be rejected, as it is not fit to send to a distant market. At the same time, if the injury is only slight, it can be sent to a local market for quick sale.

For Southern markets only perfect fruit should be selected, and further, it must be graded for size, colour, and quality, and properly packed, only one grade of fruit being packed in a case. The cost of cases, freight, and marketing is now so high that only the best fruit will pay to send to the Southern States, and even the best fruit must be properly graded and packed in order to produce the best returns.

All orchards, vineyards, and plantations not thoroughly clean should receive immediate attention, as from now till the next rainy season the ground must be kept in a thorough state of tilth and free from weeds in order, in the first place, to retain moisture in the soil, and, in the second, to enable birds, ants, and predaceous insects to get at and destroy the pupæ of fruit flies and other pests harbouring in the soil.

Banana and pineapple plantations must be put into good order, and kept free from weed growth.

Land to be planted with trees should be got ready, as, if possible, it is always advisable to allow newly-cleared land time to sweeten before planting.

Farm Notes for April.

FIELD.—Those areas already lying in fallow for subsequent sowing with wheat should be kept in good tilth, using field implements that have a stirring effect in preference to those which tend to reverse the surface soil. The surface should never be allowed to cake; consequently all showers must be followed by cultivation, as soon as conditions will permit of teams and implements working freely.

Early fodder crops, such as barley (skinless or Cape) and certain varieties of wheat may be sown during April. Growers of winter fodders will be well advised to study the article dealing with dairy fodder plots which appeared in February, 1922, Journal.

Potatoes should now be showing good growth, and must be kept free from all weed growths by means of the scuffler. If sufficiently advanced, and any doubt exists as to the prevalence of blight, advantage should be taken of fine weather to give a second spraying of "burgundy mixture," a calm and somewhat cloudy day being chosen if possible for the spraying.

Where land has been previously well prepared, lucerne sowing should be carried out this month, and intending growers of this fodder will be well advised to ascertain the germinating qualities of seed submitted to them for purchase. The difference between a good and bad "strike" is often traceable to the poor class of seed sown.

Maize and cotton crops should now be in the harvesting stage, and, once matured, are better in the barn than the open paddock, where weevils and other insects are usually prevalent at this season of the year.

Root crops sown last month should now be making fair growth, and during the early period of such should be kept free from weeds, and where necessary thinned out. Sowings of mangels, swedes, field carrots, sugar beet, and rape may still be made where conditions of moisture will permit.

As the sowing season is close at hand for certain varieties of wheat—i.e., those which require a fairly long period to develop in—every effort should be made to bring the seed bed into the best possible tilth and to free it from foreign growths of all kinds. The grading of all seed wheat is strongly recommended, and growers who favour certain varieties should adopt a system of seed selection from prolific strains with a view to the raising of larger quantities of pure typical grain for ultimately sowing in their larger fields.

Pickling of wheat to prevent smut (bunt) is necessary. Germination tests should be carried out prior to commencing seeding operations.

Sorghums which have matured and are not immediately required as green fodder should, wherever possible, be conserved as ensilage to provide for a reserve, to tide over the period when grasses and herbage are dry. Succulent fodder of this description is the best possible form of insurance against drought, and for maintaining dairy and other stock in thrifty condition.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

CLIMATOLOGICAL TABLE—JANUARY, 1934.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·75	87	74	90	6	68	31	1,603	19
Herberton	..	78	64	88	5	61	19	1,866	23
Rockhampton	29·89	88	70	98	8	65	13,15,17	177	10
Brisbane	29·97	82	67	92	9	62	23	326	9
Darling Downs.									
Dalby	29·93	86	62	97	1	50	11	213	4
Stanthorpe	..	78	56	90	26	41·4 Record.	11	406	12
Toowoomba	..	78	61	90	1	50	12	542	10
Mid-interior.									
Georgetown	29·77	91	70	99	15	66	23, 24, 26-31	1,223	12
Longreach	29·82	97	72	111	5	62	18	132	2
Mitchell	29·88	90	66	99	1, 2, 3	49	11	80	6
Western.									
Burketown	29·74	94	77	104	21	70	13	590	8
Boulia	29·76	99	76	113	5	66	8	410	4
Thargomindah	29·83	97	74	105	1, 3	62	11	10	3

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF JANUARY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING JANUARY, 1933, AND 1932, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Jan.,	No. of Years' Records.	Total Rainfall. Jan., 1934.	Jan., 1933.
North Coast.	In.		In.	In.
Atherton	12·01	33	22·09	8·41
Cairns	16·78	52	23·72	5·59
Cardwell	16·79	62	46·17	12·16
Cooktown	14·55	58	16·03	5·34
Herberton	9·60	48	18·66	6·55
Ingham	15·69	42	31·23	2·45
Innisfail	20·41	53	35·60	6·12
Mossman Mill ..	17·41	21	33·75	8·40
Townsville	11·11	63	13·87	5·99
Central Coast.				
Ayr	11·23	47	9·60	5·16
Bowen	10·18	63	8·06	7·36
Charters Towers ..	5·48	52	6·93	1·76
Mackay	14·48	63	5·38	9·05
Proserpine	16·28	31	7·75	5·34
St. Lawrence ..	9·47	63	0·87	3·40
South Coast.				
Biggenden	5·40	35	0·39	9·31
Bundaberg	8·97	51	1·28	12·50
Brisbane	6·45	83	3·26	10·01
Caboolture	7·72	47	4·34	4·91
Childers	7·67	39	1·28	8·23
Crohamhurst.. ..	12·61	41	9·21	7·09
Esk	5·73	47	4·83	5·96
Gayndah	4·70	63	0·52	6·40
Gympie	6·72	64	3·24	6·67
Kilkivan	5·60	55	2·79	5·46
Maryborough ..	7·28	63	2·44	5·61
Nambour	9·88	38	4·98	5·72
Nanango	4·69	52	2·14	4·48
Rockhampton ..	7·83	63	1·77	12·44
Woodford	7·91	47	5·75	4·89

Divisions and Stations.	Average Rainfall. Jan.,	No. of Years' Records.	Total Rainfall. Jan., 1934.	Jan. 1933.
Central Highlands.	In.		In.	In.
Clermont	5·21	63	1·78	11·44
Gindie	3·83	35	0	5·51
Springsure	4·27	65	0·29	5·03
Darling Downs.				
Dalby	3·28	64	2·13	4·44
Emu Vale	3·19	38	3·89	5·08
Hermitage	3·24	28	3·67	6·48
Jimbour	3·54	46	1·56	4·12
Miles	3·63	49	3·77	3·46
Stanthorpe	3·57	61	4·06	7·52
Toowoomba ..	5·07	62	5·42	9·40
Warwick	3·56	69	3·90	7·48
Maranoa.				
Roma	3·14	60	0·55	2·22
State Farms, &c.				
Bungeworgorai ..	1·84	20	0·54	1·38
Gatton College ..	4·30	35	4·54	10·26
Kairi	9·32	20	20·82	5·04
Mackay Sugar Experiment Station	14·57	37	5·01	7·27

GEORGE G. BOND, Divisional Meteorologist.

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	March, 1934.		April, 1934.		MOONRISE. Mar, 1934.	MOONRISE. April, 1934.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	5·45	6·25	6·2	5·50	6·11	6·17
2	5·46	6·24	6·3	5·49	6·41	6·55
2	5·46	6·22	6·3	5·48	7·11	7·41
4	5·47	6·21	6·4	5·47	7·42	8·35
5	5·48	6·20	6·4	5·46	8·18	9·35
6	5·48	6·19	6·5	5·45	8·58	10·39
7	5·49	6·18	6·6	5·43	9·44	11·45
8	5·49	6·17	6·6	5·42	10·38	..
						a.m.
9	5·50	6·16	6·7	5·41	11·39	12·53
10	5·51	6·14	6·8	5·40	a.m.	1·57
11	5·52	6·13	6·8	5·38	12·45	3·1
12	5·52	6·11	6·9	5·37	1·52	4·4
13	5·53	6·10	6·9	5·36	3·3	5·4
14	5·54	6·9	6·10	5·35	4·9	6·3
15	5·55	6·8	6·10	5·34	5·14	7·3
16	5·56	6·6	6·11	5·33	6·17	8·6
17	5·56	6·5	6·11	5·32	7·18	9·5
18	5·56	6·4	6·12	5·31	8·21	10·1
19	5·56	6·4	6·12	5·30	9·20	10·53
20	5·56	6·3	6·13	5·29	10·21	11·43
						p.m.
21	5·56	6·2	6·13	5·28	11·17	12·28
22	5·56	6·1	6·14	5·27	12·12	1·6
					p.m.	
23	5·56	6·1	6·14	5·27	1·2	1·39
24	5·56	6·0	6·15	5·26	1·49	2·11
25	5·57	5·58	6·15	5·25	2·32	2·40
26	5·57	5·57	6·16	5·25	3·9	3·10
27	5·58	5·55	6·16	5·24	3·41	3·41
28	5·59	5·54	6·17	5·24	4·12	4·14
29	6·0	5·52	6,17	5,23	4·41	4·51
30	6 1	5·51	6·18	5·22	5·12	5·35
31	6·2	5·50	..	..	5·44	..

Phases of the Moon, Occultations, &c.

1 Mar.	○	Full Moon	8 26 p.m.
9 ,,	☽	Last Quarter	4 6 a.m.
15 ,,	●	New Moon	10 8 p.m.
23 ,,	☾	First Quarter	11 44 a.m.

Perigee, 12th March, at 7.42 p.m.
Apogee, 24th March, at 3.54 p.m.

Neptune, in Leo, 12 degrees east of Regulus, will be in conjunction with the full moon, which will be passing it 3 degrees to the south on the 1st. It will be in opposition to the Sun on the 2nd.

Jupiter, in Virgo, within 3 degrees of Spica, will be passed by the Moon at 7 a.m. on the 5th.

Mercury will be in inferior conjunction with the Sun on the 6th, but being 3 degrees further north there will be no transit across the Sun's face.

The occultation of Antares, in Scorpio, on 8th March, will occur below the horizon of Warwick, the hour-angle being 8 hours 6 minutes west.

On 11th March Venus will again almost recover its great brilliance, as in December last.

Venus will be in conjunction with the Moon 4 hours after they have both set on the 12th.

Saturn will be in conjunction with the Moon on the 13th, about 2 hours after they have set.

Mercury will be in conjunction with the Moon on the 14th when both are too near the Sun to be seen.

At 2 p.m. on the 16th the Moon will pass 5 degrees north of Mars; on the 18th at 9 a.m. the Moon will pass Uranus, 6 degrees on its northern side.

The Sun will reach the junction between the ecliptic and the celestial equator on 21st March, and will pass from the southern to its northern side, the day and night each having 12 hours.

On the 29th at 7 a.m. the Moon will be passing Neptune at a distance of 3 degrees.

Mercury sets 14 minutes after the Sun on the 1st; on the 15th it rises at 4.41 a.m.

Venus rises at 3.28 a.m. on the 1st and at 2.53 a.m. on the 15th.

Mars sets at 6.57 p.m. on the 1st and at 6.30 p.m. on the 15th.

Jupiter rises at 8.26 p.m. on the 1st and at 7.29 p.m. on the 15th.

Saturn rises at 4.21 a.m. in the 1st and at 3.33 a.m. on the 15th.

Mercury will be near the border of Aquarius and Pisces, Right Ascension 23·14 on the 1st, moving westward into Aquarius to R.A. 22·59 on the 31st.

7 April	☽	Last Quarter	10 48 a.m.
14 ,,	●	New Moon	9 57 a.m.
22 ,,	☾	First Quarter	7 20 a.m.
29 ,,	○	Full Moon	10 45 p.m.

Perigee, 7th April, at 9.12 p.m.
Apogee, 21st April, at 11.42 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

The Dairy Industry.

"DAIRY farming has ceased to be merely an application of manual labour yielding satisfactory results; it is now a combination of energy, skill, scientific knowledge, and economics." That was one of the telling points made by the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, in a brief address of welcome to the Dairy Committee leaders on the occasion of their visit to the Department in the course of the month. Continuing, Mr. Bulcock said that with the idea of giving practical assistance to primary industry, legislation had been passed and applied with the object of enabling the producer to get the best out of his farm along the most economical lines. By taking the line of least resistance it was quite easy to avoid adverse criticism; but it would also be agreed that adverse criticism when soundly based could not be entirely disregarded.

Causes of economic loss in the dairy industry could be roughly classified into three groups—neglect of the means provided for herd testing; the keeping of inferior stock; and animal diseases. Some of the factors contributing to loss of income could be controlled by the farmers themselves co-operating when necessary with the officers of the Department of Agriculture and Stock. Herd recording commended itself as one of the essentials of profitable dairy practice. While there was evidence of a growing desire among dairy farmers in Queensland to adopt systematic herd testing, a disinclination was observable in some quarters to contribute to the carrying out of that work. Discussing matters

relevant to modern dairy practice, the Minister said that if a commodity board were merely a marketing board, then the consumer would be at the mercy of that board. Production, however, could be made much cheaper, and the existence of a commodity board in an industry should be a stimulus to greater efficiency in that industry. Since the year 1931-32, the dairy farmers of Queensland had gained an advantage of £154,576 over the producers of New South Wales, and £218,446 over the producers of Victoria. Last year the advantage over New South Wales amounted to £84,000, and over Victoria to £141,000. Those substantial amounts represented the contributions made by the purchasing public to the dairy industry. Queensland people recognise the necessity of primary producers receiving prices for their products that made conditions of country life reasonably satisfactory; but if they were prepared to pay those prices they had a right to demand the highest degree of efficiency in the industry.

Herd Testing.

CONTINUING his address to the visiting dairy leaders, Mr. Bulcock said that there were 880 herds under official test in Queensland, a very great increase on previous figures. That was evidence of a growing desire to get rid of the "boarder" and build up herds from which a fair financial return might be expected. The distribution of the dairy herds undergoing test was West Moreton, 160; Darling Downs, 260; Central District, 200; Atherton Tableland, 20; and directed through the head office of his Department, 240. Over 700 purebred cows were under official test, a material contribution to the work of dairy herd improvement. He pointed out that no man could succeed unless he was prepared to engage in every possible phase of economic dairy practice; and that was the reason why Local Producers' Associations had been asked to select dairy leaders with the object of their visiting the Department to familiarise themselves with the activities of the Dairy and Stock Branches. Such visits would enable them to appreciate the importance and the value of the work that was being done by his Department every day in the interests of the primary industries of the State They would also be able to assess the difficulties encountered in the direction of the dairy industry and in the administration of the legislation by which it was governed; and also observe the efficacy and extent of the measures devised for the surmounting of those difficulties.

Herd Improvement.

STRESSING the importance of a continuous policy of herd improvement, Mr. Bulcock referred to the economic losses resulting from the keeping of inferior stock. Everybody, he told the dairy leaders, would recognise the necessity for getting the best dairy stock that was possibly obtainable. There did seem, however, to have been an attempt, by persons seeking party political preferment and others, to assail the policy of encouraging farmers to keep only the very best stock in their dairy herds. Although the precept issued recently on the commodity boards of the dairy industry for the purposes of the "better bull scheme" only amounted to £5,000 a year in all, the State made a contribution equal to the amount subscribed by the industry; but that £1 for £1 contribution by the Government by no means represented the whole of the public money spent on dairy research and administrative work, which, unquestionably, was of the utmost value to the dairy industry.

Stock Diseases.

DISCUSSING economic losses due to the incidence of animal diseases, Mr. Bulcock said that Departmental effort had been persistently misrepresented in some quarters, particularly in respect of contributions required from the industry to assist in the solution of some of the pathological problems which confronted all engaged in animal husbandry. The control of disease required the employment of trained men. In regard to the control of stock diseases generally, the producer had an obligation to the public, for some diseases, such as bovine tuberculosis, were communicable to man; the producer also had an obligation to himself, for heavy economic loss was involved in the milking of diseased cows, which had to be destroyed ultimately. The Minister pointed out that that phase of animal husbandry was claiming the attention of all Departments of Agriculture where dairying was an industry of any magnitude. A sum had been placed on the Estimates by the Government, and a board constituted—after consultation with the dairy leaders of the State—to spend that money judiciously in improving the industry. He stated that he had never asked the board to interview him, unless the board had first expressed a desire to discuss dairying matters with him. There was room, he added, for the extension of the veterinary staff of the Dairy Branch of the Department, for one of the most urgent matters for attention was the control of disease. Dairy inspectors, from time to time, were brought in from their districts to undergo refresher courses at the Animal Health Station at Yeerongpilly, in order that they might acquire or refresh their knowledge of modern methods of disease control and return to their posts as, virtually, field officers of that Station. If the Queensland dairy industry were allowed to remain on the ground it at present occupied, then the industry in other States and other countries would forge ahead of it. Their costs of production would be lower, with the natural consequence of their being able to sell at lower prices. If that happened, the Queensland industry would deteriorate, without their having even the satisfaction of knowing that every effort had been made to save it.

Stabilisation of the Dairy Industry.

MR. BULCOCK concluded his address to the dairy leaders with the statement that the stabilisation legislation passed by the Federal Parliament and the Parliaments of New South Wales, Victoria, Tasmania, and Queensland was the consummation of the desire to establish an Australian price, based on Australian conditions, for dairy produce, in order that the domestic market would not be subject to the fluctuations that had proved so detrimental to the industry generally. The Australian market would be a more profitable market to the producer when stabilisation was effectively established. The Queensland market had been inundated with butter from New South Wales and Victoria—to a greater degree from Victoria—and every pound of butter from the South displaced a pound of their own butter on their own local market. The stabilisation scheme would prevent the dumping of Southern butter upon the local market, unless, of course, it was offered at Australian parity. The Queensland industry would, in consequence, benefit very substantially, but the community, obviously, could not be expected to pay a premium on inefficiency. The Queensland industry must, therefore, safeguard itself against economic loss in the directions he had specified by aiming at the attainment of the highest possible degree of dairying efficiency.

The Call of the Land.

WHAT ST. LUCIA TRAINING FARM IS DOING.

By FRANK W. BULCOCK, Minister for Agriculture and Stock.

THE cry, "Go on the land, young man," is raised in periods of adversity as well as in times of prosperity. It is one of those generalisations that often do more harm than good, for qualification is needed. This qualification should be—"Go on the land, young man, if you have an inclination in that direction." Successful farmers are the product of physique, character, and training, and never in the history of Australia has more attention been paid to these phases of development.

The indiscriminate selection of city youths for country pursuits is doomed to failure, but, given a proper system of selection, there is no doubt that many youths will find contentment and happiness in primary pursuits.

The pessimist is inclined to say, "Why put more people on the land when those already engaged in rural pursuits are not earning a competence?" And it is an argument that warrants serious consideration.

Our Agricultural Destiny.

There are a number of reasons why a State must engage in an active "young man's" land movement under proper conditions. First, if we agree that the limits of production have been reached, then there is no hope in the future for Queensland, in common with Australia generally. We cannot escape our agricultural destiny, and, therefore, must wisely direct it. Wise direction must be the very opposite of the policy of despair that is associated with restriction of land settlement. Rather must we produce with skill and distribute with wisdom.

Queensland is a primary producing State, and, while we are labouring under the cloud of depression, it is natural to expect that our primary industries will suffer, but economic surveys show that these periods of depression alternate with periods of prosperity. One of the great difficulties confronting the statesmen and economists of the world is to regulate the phases of economic interplay and evolve a system whereby a general, satisfactory average shall be obtained. This surely is not beyond the ability of mankind, and agricultural history of recent years shows distinct evidence of stabilisation. Australia can never agree to a policy of general limitation of production, and I believe that this phase, which is associated with present circumstances, will pass away with the passage of the conditions that have given rise to the advocacy of restriction.

The time, therefore, to prepare for the farming future of the State is now, and the material to employ is the youth, both of the country and city. It might reasonably be asked what attraction does a farming life offer over and above the life of an industrial unit in the city? Parents, generally, should weigh that question seriously in defining the future of a son.

Life on the Land.

It is obvious that industry depends on agriculture, and, with the expanding policy of the fulfilment of national requirements within the nation, the expansion of secondary industries depends on the expansion

of agriculture within our Commonwealth. Nor can we assume that in industry every youth will become a captain of industry, but every youth may become an independent farmer. There are periods of anxiety on the land. One cannot minimise the risk of drought, disease, and crop failure, but the farmer has a home, and he is never confronted with that soul-destroying problem of unemployment. This cannot be said for the city artisan.

A survey of present prospects cannot encourage parents to hope for the speedy employment of their sons in industrial occupations, and an additional handicap is the ever-increasing volume of girls and women who now find employment in industry. Queensland has the lands and has the adaptable youth, but the problem of bringing these two together is difficult of adjustment. I believe it lies particularly in an appreciation on the part of parents of the merits of a farm career for their sons, the promotion of a land consciousness and, lastly, a recognition of the channels through which a youth should pass in order to be a farmer.

Training is Essential.

From time to time parents interview me and seek advice as to the wisdom of investing their savings in a farm for a son. Invariably the advice I tender is against this course. A youth without previous training cannot succeed on the land in the way he would succeed were he trained. At one time the most popular expressions to designate the farmer and settler were "cocky," "way back," and "country cousin," each term carrying with it a suggestion of inferiority.

A few years ago it was not popularly supposed that a farmer was a scientist combining skill and resource to wrest a living from the soil. To-day this viewpoint has disappeared, and farming is rightly regarded as a dignified and worthwhile occupation. The farmer of the old school is disappearing and giving place to the younger men, who have an appreciation of and respect for agricultural education and research in all its many phases. Farming is a difficult occupation. It calls for resource, physical capacity, and intelligence. The theory that any man can be a farmer is entirely wrong, but as farming develops the national traits of perseverance and resource we need not fear on this score.

As a compensation for the difficulties associated with farming the Government maintains a very extensive agricultural organisation which is at the service of the farmer on all occasions.

St. Lucia Training Farm.

The question now arises—what should be done to discover whether or not a lad is likely to develop land mindedness? With this end in view the St. Lucia training farm was established. Here, under pioneer conditions, fifty boys are put through a rudimentary course in agriculture. We have not endeavoured to surround the boys with a luxury of farming equipment to which they cannot aspire immediately in their own enterprise, but we have succeeeded in awakening a land consciousness within the minds of many of our students, who are drawn from unemployed sources, and the demand for these boys is greater than the supply.

We pursue a follow-up policy in regard to our ex-students, and it is satisfactory to note that, in the vast majority of cases, these boys have settled down to farming pursuits in a splendid manner. There is no suggestion that all boys enrolled at St. Lucia are potential farmers, but,

as far as possible, we impress on the boys their obligation to themselves to become independent farmers, when training is complete and opportunity offers.

The boys who leave St. Lucia are not competent farmers, but the aims of the farm would be defeated if we sought to turn out a batch of farm labourers. St. Lucia is a successful experiment in preliminary farm training, and the attention of parents of unemployed boys is drawn to the advantages such a farm offers, combining as it does both training and the distinct promise of employment.

One of the great handicaps to engaging in farm pursuits is the problem of finance, and in order to meet this difficulty the Agricultural Bank was established. Under various managers it has made a material contribution to agricultural finance and stability. In addition to the bank's ordinary programme there was placed on last year's Estimates the sum of £50,000 for the purpose of assisting persons who do not fall within the category of those who are qualified for assistance from the bank. This fund has been of great assistance to many persons who required short-term credit for small amounts to tide them over occasional periods of adversity.

These things are mentioned in the hope that youths may realise that the State is prepared to find finance for the settler who desires to capitalise his efforts, and whilst no "wet nursing" is practised, yet the Agricultural Bank and the Rural Assistance Board are available for the purpose of providing for agricultural finance.

Personally, I believe that the land offers bright opportunities for many of our youths. Let a youngster whose mind is turning to agriculture ask any farmer of his acquaintance if he would abandon farming and take to the hazardous life of an industrial city dweller. I rather fancy the answer will be an emphatic NO!

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

PLATE 105.

CONFERENCE OF MINISTERS OF AGRICULTURE, HOBART, 19TH TO 23RD FEBRUARY, 1934.

Back Row (left to right): Messrs. J. T. Thynne, ———, H. Luckman, R. P. M. Short, J. M. Ward, H. Thompson, J. T. Armstrong, C. G. Savage, L. S. Smith, P. H. Thomas.

Second Row: Messrs. H. C. Smith, E. A. Kendall, Miss Jean Easton, Messrs. G. L. Sutton, R. Wilson, G. D. Ross, F. E. Ward, H. A. Mullett, A. J. Perkins, L. T. MacInnes, R. C. T. Philp, H. B. Barlow.

Front Row (seated): Hons. H. Millington (W.A.); A. P. Blesing (S.A.); H. Main (N.S.W.); A. L. Wardlaw (Tas.); J. Allan (Vic.); F. W. Bulcock (Q.).

Products of the Hive.

By HENRY HACKER, F.E.S., Entomological Branch.

EVERYONE knows that honey is the principal product of the apiary, but it may not be so generally realised that in the hive other products are being handled and manufactured by the bees. The following notes have, therefore, been compiled in order to give some idea of the hive products, their nature, and relative value. As honey constitutes the chief product of the hive it will be considered first, the other products in their order of importance being beeswax, pollen, and propolis.

Honey.

Nectar is the raw material from which the bees manufacture honey, and it consists chiefly of a solution of sugars with small amounts of other materials, including colouring matter, and those ingredients which give to honeys their characteristic flavours.

The field bee derives its supplies from the successive blooms of a great variety of trees, shrubs, and other cultivated and wild plants, of which those belonging to the order *Myrtaceæ*, which include the Eucalypts, are by far the most important in this State.

When first gathered nectar is a thin watery liquid possessing a raw, rank taste. To make from this raw product the wholesome and delicious food which honey constitutes, is one of the functions of the worker bee.

There have been two theories offered to explain how the honey-bee reduces the high water content of nectar to the low water content of honey; these are known as the excretion and the evaporation theories. The first of these is based largely upon the well-known observation that bees carrying nectar often eject a tiny spray of colourless liquid. This was assumed by some of the earlier observers to be the result of a process within the body of the bee whereby some of the excess water was eliminated from the nectar while the bee was carrying it to the hive. Largely as a result of experiments made by O. W. Park, in Iowa, United States of America, it is now known that the evaporation theory is the correct one, and the evaporation of nectar is carried out within the hive. The nectar-carrying bee, upon her return from the field, delivers her load to one or more house-bees, which then put the nectar through a process of kneading with their mouthparts, which apparently reduces its water content and probably permits the addition of enzymes, such as invertase, which are said to be produced by the salivary glands. Park also observed that instead of depositing the entire load in a single cell, the house-bee often distributes it by attaching a small hanging drop to the roof of each of several cells; these small hanging drops present relatively large surfaces from which moisture can evaporate rapidly. Later the droplets are collected, and it is assumed that they are again put through the process of manipulation by the mouthparts.

The evaporation of the nectar is carried to a further stage by worker-bees which station themselves in line near the hive entrance. These, by the continual buzzing of their wings, drive currents of air

into and out of the hive and over the comb surfaces. If the hand is held before the entrance at such a time a strong current of warm air may be felt coming out. The loud buzzing heard at night during the summer time is due to the wings of workers engaged chiefly in ripening nectar. When finally this process is completed, it is found that the water content has been reduced to about 15 to 20 per cent., and that the disagreeable odours and flavours, probably due to volatile oils, have also been driven off. The finished product is stored in cells above and around the brood nest and the main cluster of bees. The work of sealing with waxen caps then goes forward rapidly, the covering being more or less porous. This sealing of the cells indicates to the bee-keeper that the honey is "ripe," and in the right condition for extraction.

Ordinarily honey is judged by its colour, flavour, and density. The very great range in its colour is due entirely to the sources from which it is obtained. The colour varies from almost white, through straw and amber to reddish. It has been known to be blood red, and again to have a greenish tinge, and still be absolutely pure. The aroma and flavour of the honey varies also very considerably. White clover and lucerne honeys are generally admitted to a preference as to appearance and flavour, although many people who are used to the more strongly flavoured eucalyptus honeys consider the former to be rather insipid. It must be noted, however, that lightness of colour alone is no conclusive evidence of superior quality, and honey of the darker colours, as well as honey of the lighter colours, may be of the higher grades and quite suitable for table use. Some of the most prized honeys, as for instance that gathered from orange blossoms, is of very deep colour, while the famous heather honey of Europe is quite dark, and yet no honey stands higher in popular esteem on that continent.

Honey is marketed in three principal forms—extracted or liquid honey, which has been separated from the uncrushed comb by centrifugal force or gravity; comb honey contained in the cells of comb, usually in 1 lb. sections; chunk honey which is sometimes retailed here, in which comb is cut into rectangular pieces and placed in the container with the liquid honey, which, if packed in glass, increases the attractiveness of its appearance.

The very great proportion of the honey produced is the extracted variety. Bees are ordinarily able to produce a larger quantity of honey if they are not compelled to build comb for it, and by emptying the combs and replacing them in the hive, the bee is able in periods of heavy nectar secretion to proceed immediately to the storage of more honey.

The production of comb honey requires much greater skill and experience on the part of the beekeeper, and can only be carried out successfully in limited areas where the conditions are favourable. It should not be attempted in localities where the honey flow is slow or intermittent, where the character of the honey flow is such that it granulates quickly in the comb while it is on the market, or where the honey is dark in colour. Local market conditions in some instances may, of course, be such as to make it seem advisable to produce comb-honey in limited quantities in a locality that is not well suited to comb-honey production, but the beekeeper who expects to produce comb-honey for the general market should first be sure that his is a comb-honey locality.

Almost all honeys granulate or "candy" after a certain time. Those which are high in dextrose or grape sugar will granulate very quickly after being exposed to the air by extraction. Granulation is hastened during periods when there is the greatest difference between day and night temperature. Conversely, the liquid condition may be maintained best by exposure to moderate heat; for instance, a honey which ordinarily granulates quickly may remain liquid for years if stored under a roof exposed to the sun. For this reason, storekeepers commonly keep their stocks on the warmer top shelves of their stores.

The following information relative to the sale of Australian honey in the United Kingdom is taken from a recent report issued by the Empire Marketing Board:—

"The greater part of Australian honey is marketed in England under the label 'Golden Wattle,' the brand applied to the produce of the Australian honey co-operative associations shipped to their agents, the Overseas Farmers' Co-operative Federations Limited.

"The term 'blend' in connection with honey has several shades of meaning. In the country of origin, honey from many farms and apiaries is blended in preparation for export; on arrival in the United Kingdom, honey from different parts of a single country may be blended to produce a standardised representative type; and again, honeys from several countries are frequently mixed or blended together.

"After blending, the honey is placed in small containers for retailing. The most popular type is the glass jar which, with an effective label, presents a clean appearance and shows the clearness and colour of the honey.

"Australian honey was stocked in about 10 per cent. of the London shops stocking honey, and was classed among the less expensive honeys. London prices for the 1-lb. glass jar ranged from 11d. to 1s. 6d., 1s. 3d. and 1s. 4d. being the most usual prices, while the ½-lb. jar was generally retailed at from 8½d. to 10½d.

MANUFACTURING DEMAND.

"*Chemists.*—The two pharmaceutical preparations containing honey which are in widest use are oxymel of squill, an important constituent of many cough mixtures, and honey borax. Honey is also widely used in the manufacture of proprietary cough cures, balsams, and lung tonics.

"*Confectioners.*—The products in which honey mostly occurs are chocolates, where it is chiefly used to form centres, but it is also employed in the manufacture of toffee, turkish delight, caramels, and nugat.

"*Bakers and Biscuit Makers.*—Honey is used to a limited extent in the making of cakes, biscuits, rusks, and gingerbread, mainly for flavouring; dark honey is used for colouring certain kinds of biscuit, while honey is said to have a preservative effect in cakes and gingerbread, maintaining in the product a palatable moisture."

Beeswax.

Beeswax is secreted by special glands in honey-bees of a certain age, which are situated on the ventral surface of the abdomen. A reasonably high temperature and a honey flow are necessary for its

production. If the bees are closely watched under these conditions, little pearly discs of wax somewhat resembling fish scales will be seen protruding from between the segments on the underside of the abdomen. These wax scales are scraped off with the spines of one hind leg, then pushed forward and grasped by the front legs and transferred to the mandibles, where they are manipulated or masticated, after which they are applied to the comb. During the process, the bee stands on three legs, the two intermediate legs and one hind leg not in action, while the other hind leg and the two fore legs, in connection with the mandibles, perform the manipulation. Each individual bee removes its own wax scales without any assistance.

At the time a swarm is hived, there is no wax in the hive under natural conditions. The wax secretions, however, become very active, and in an extremely short time the hive is supplied with combs. It is also true, of course, that wax is secreted at any time during the active season, when it is necessary that more combs be built to accommodate brood or stores, provided, of course, that there is room. If a comb is removed from the centre of the brood chamber or from the super, it is replaced as needed, but, as a rule, not so rapidly. The rapidity of the honey flow influences this wax secretion greatly.

Notwithstanding the fact that wax is a more valuable article than honey, it pays the beekeeper of to-day to produce honey in preference to making the bees expend their energies in the production of wax. With modern methods of extraction the honey is removed from the combs, and these are again given to the bees or carefully stored away for use during the following season. The wax which the beekeeper now obtains results from the melting-up of cappings, old combs, or combs exhibiting faults, such as stretched cells, or those having too great a proportion of drone cells.

Beeswax has many uses both in the arts and in commerce, and fresh uses are continually being found for this product. A very satisfactory floor finish can be made by melting 1 lb. of beeswax, and while it is cooling, stirring into it some turpentine, the proportion varying according to whether the mixture is required to be thin or thick. Certain grades of blacking, harness oils, and lubricants require pure beeswax in their manufacture. Large quantities of beeswax in the form of candles are used in churches. The electrical supply business is a large consumer; the windings of the electric wires are soaked in beeswax to prevent their being affected by extremes of heat or moisture. Even the dentistry profession consumes large quantities every year to take impressions in the mouth. Last, but not least, the beekeeper himself is a large consumer as well as a producer of wax.

Pollen.

Pollen is the reproductive substance of flowers, which is transferred from the male to the female portion of the flower or from the male flower to the female flower for the reproduction of the species. Nature has provided various methods for this transfer. Amongst these are flying insects, of which bees are the principal. Pollen is highly nitrogenous and contains necessary vitamins. Nature is always prolific, and provides more than is necessary for reproduction purposes. Bees, as they visit flower after flower, carry the pollen from the anthers and fertilize the styles. In doing this they take a toll for their service, and carry some of the surplus pollen away to their hives to make food for

their young larvæ. When breeding is taking place, the nurse bees convert honey and pollen into chyle food, which is deposited in the larval cells. Pollen is generally yellow or orange in colour, but it may be other colours, such as white, green, or blue, according to the source from which it is obtained.

Pollen may be collected by the worker-bee upon its mouthparts, upon the brushes of its legs, and upon the hairy surface of its body. When the bee collects from small flowers, or when the supply is not abundant, the mouthparts are chiefly used for gathering it. The specialised brushes on the legs are used to remove the pollen grains from the body and transport it to the pollen baskets of the hind legs.

The pollen grains are slightly moistened with honey to make them cohesive, and after the load has been carried to the hive it is deposited by the bee within one of the cells of the comb. It is then packed in the cell by some other worker, which flattens out the rounded masses and adds more fluid to them.

Propolis.

Propolis is known to every beekeeper under its commercial name of "bee glue." Its source has been questioned recently, but ordinarily it is supposed to be collected by the bees from the waxy bud scales and other parts of various trees. In any case, the bees bring it in from the field in much the same manner as pollen. Their uses for it are many: with it the frames are cemented in place, the covers and bottom boards are glued fast to the hive body, the hive entrance is contracted, and cracks are stopped against cold draughts and robber bees. During a recent inspection tour, mounds of propolis were seen on the floor of several hives, and a further examination showed a dried mouse under each mound. The mice had evidently crept into the hives and had been stung to death by the bees, but finding that the bodies were too heavy to drag out, the bees had sealed them to the floor of the hive with a thick coating of propolis. Because it liberates a very pleasant odour while burning, it sometimes serves as a sort of incense, especially for church rites. Much propolis is said to be used in Europe and elsewhere for this purpose, but there is no market for the substance in Queensland.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

Parasitic Worms of Poultry.

By P. RUMBALL, Poultry Expert.

A LARGE number of animal parasites are found in the digestive tract of poultry, some of which cause serious disturbance of the digestive functions, while others are apparently harmless. Those usually met with, however, may be classed as round worms (nematoda) and tape worms (cestoda). The former, by reason of the fact that they are the more common, claim prior attention. Various worms are found in the crop, stomach, gizzard, intestines (both upper and lower portions), and the blind gut. The lastmentioned are responsible for serious losses and are particularly hard to expel. The accompanying plates should give poultry breeders some idea of the extent to which infestation is possible.

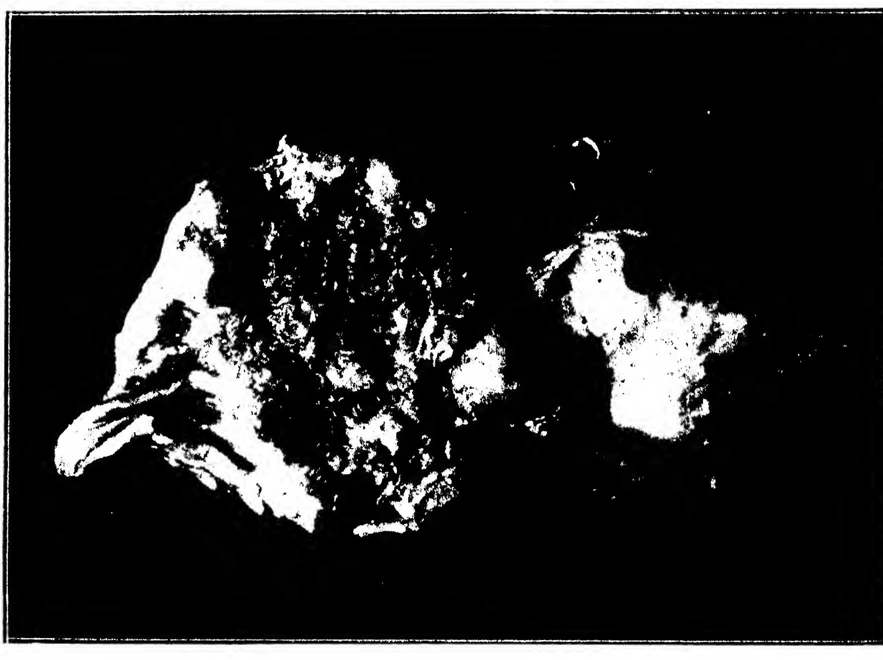

PLATE 106.

The Stomach of a Fowl (left) showing Worm Infestation. By looking closely the minute worms (life size) are easily discernible.

That portion of the digestive tract between the crop and gizzard is shown in Plate 106 heavily infested with worms. These worms were more or less encysted in the walls of the stomach, causing ulceration and eventually rupture.

In this plate the nodules caused by the gizzard worm are illustrated. On examination of the lining of the gizzard perforation will be noticed, and on removal of the lining the end of the worm will frequently be

PLATE 107.—THE GIZZARD OF A WORM-INFESTED FOWL

seen protruding from the muscular tissue. They are difficult to extract complete and vary considerably in size.

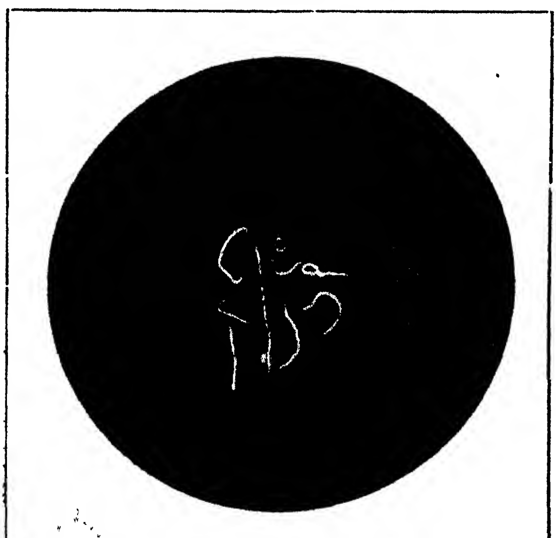

PLATE 108.—GIZZARD WORM (NATURAL SIZE).

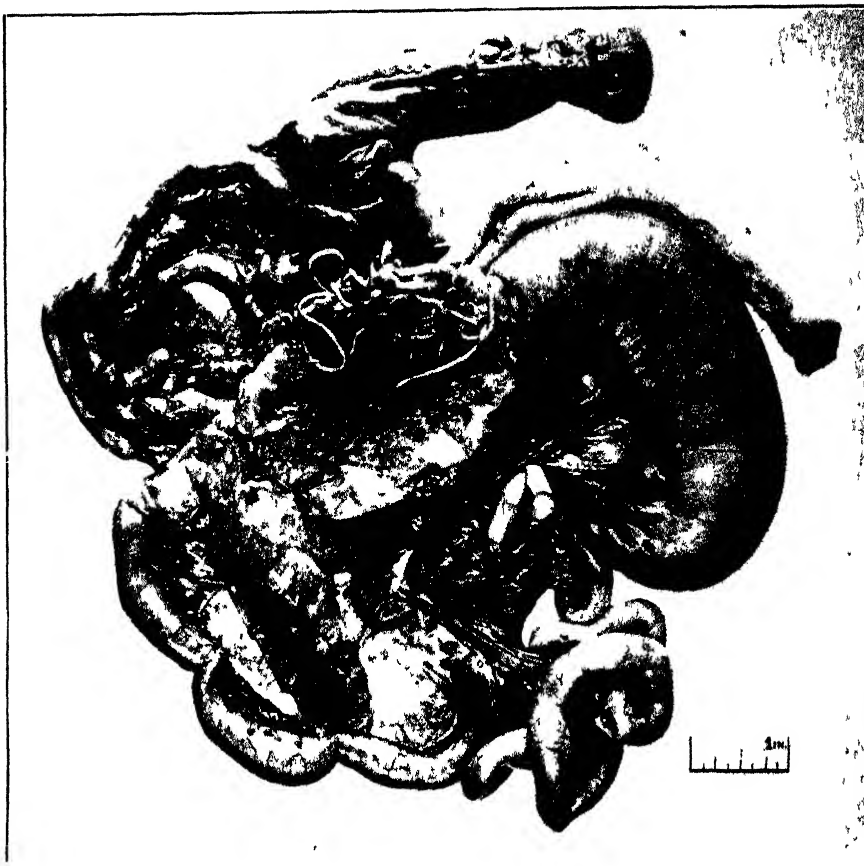

PLATE 109.

INTESTINE OF AUSTRALORP HEN WHICH DIED OF STOPPAGE DUE TO TUMOUR AND BALLING OF WORMS.

This plate illustrates possibly one of the most common of intestinal parasites met with in poultry, and also the harm ensuing on their unchecked multiplication. In all probability the tumourous growth was due to parasitical infestation.

Life History of Round Worms.

It is not intended in these notes to trace in detail the life history of the several round worms found in poultry—in fact, in many cases it is unknown—but it is proposed to deal briefly with those most frequently met with. The adult female worm lays its egg in the digestive tract, which is voided in the excreta. The egg is further developed in the soil, and subsequently enters the digestive tract of the fowl by adhering to particles of food picked up by it. In the digestive tract of the bird it completes its development. For the development of the embryo worm in the soil moisture is necessary, and that is why more general infestation is observed among poultry running in damp yards. After numerous post-mortem examinations, and a study of the environ-

mental and other conditions of the unthrifty flocks affected, one is forced to the conclusion that propagation of certain worms may occur in the infested host itself. A study of the illustration (Plate No. 109) supports this conclusion.

Preventive Methods to Avoid Infestation.

Having a general idea of the life history of round worms, what action can be taken to prevent general infestation? As worms are spread from bird to bird by eggs, infested stock should never be brought on to relatively clean premises. As the eggs occur in the excreta from infested stock, particular attention should be given to the regular cleaning-up of droppings; by doing so you not only assist in preventing the spread of worms, but preserve your fowl manure in its most valuable form. It is impossible to thoroughly cleanse the runs attached to poultry buildings, but they can be spaded over occasionally and, where other accommodation is available, allowed to remain unstocked for a

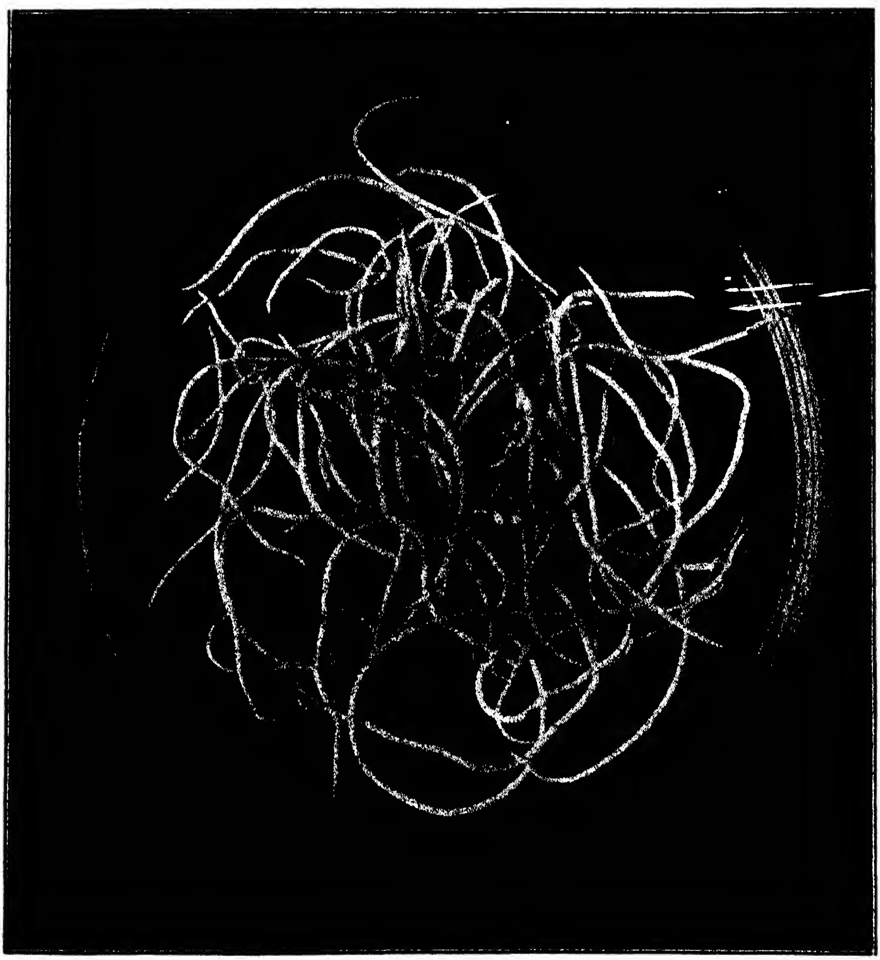

PLATE 110.—LONG WORMS (NATURAL SIZE) WHICH WERE REMOVED FROM INTESTINES OF BIRD ILLUSTRATED IN THE PLATE ON THE PRECEDING PAGE.

reasonable quarantine period. The feeding of all mash foods, foods to which eggs would readily adhere, should be done in suitable containers, and where large numbers of birds are yarded several such containers should be provided to prevent portions of the mash from being spread about the yard.

Worm-infested stock are poor producers, and where infestation is severe the vitality of the birds is lowered, rendering them more susceptible to disease. Young chickens when hatched are of course free, and every effort should be made to maintain them in that condition, particularly during their growing stages. To do this they should be reared on ground which has not been fouled by adult stock. Do not make use of chicken-rearing pens, brooder-houses, &c., as temporary quarters for stock of any kind; by strictly adhering to this principle it is possible to place in the laying pens well developed stock that will give results. On the other hand, if growing stock become infested their growth is retarded and their vitality so lowered that they fall easy victims to diseases of an epizootic nature, such as roup and chicken pox, both of which are prevalent during the growing period and frequentl, assume a more virulent form with this class of stock.

Diagnosis.

The symptoms which indicate the presence of worms are not very characteristic. The birds become dull, weak, emaciated, and sunken in face, losing all colour both in head and legs. The plumage loses its lustre and becomes roughened. Where infestation is not severe they are ravenous, but with the increase of worms their appetite diminishes, and they have no inclination to look for food. Their walk becomes stiff, and diarrhœa is often present. Generally birds infested with worms have the appearance of suffering from some chronic dsease.

Medicinal Treatment.

Too much reliance must not be placed on the ease with which worms can be expelled by medicaments, as the best are only partially effective. Therefore, it should be the aim of the producer to avoid infestation by every means in his power.

Many treatments could be recommended for individual birds, but the capsule method is the most convenient and, at the same time, very efficient. Worm capsules may be obtained in sizes according to the class of bird to be treated.

For flock treatment, tobacco dust at the rate of 2 per cent. in the mash has been found reasonably effective and economical. This quantity might be incorporated in the mash daily for a period of two weeks. After three to four weeks, the treatment might again be applied if worms are numerous. During the period of treatment Epsom salts at the rate of 1 oz. to each gallon of drinking water should be administered once a week, and again at the termination of treatment.

Tape Worms.

Heavy infestation of tape worms is not common, but, although this is so, producers should not lose sight of the fact that when such infestation does occur the consequence is serious. There are many species affecting poultry and there is a great variation in size. Some are so small that a hand lens is almost essential to distinguish them, while others may be found a foot or more in length.

To complete its life cycle, an intermediary host is necessary to the tape worm. One of the known hosts is the slug, another the fly, and another the earth worm.

The method of spread of the tapeworm is as follows:—The ripened segments of the worm are voided with the excreta. The intermediary host feeding upon the excreta where the tape worm eggs are present ingest the egg. The worm egg becomes encysted within the host, there undergoing a portion of its life cycle and completing it when the host is eaten by the birds.

The first line of attack is to remove the intermediary host, for without the host tape worm infestation could not ordinarily occur.

Strict sanitation materially assists in checking the number of worm eggs that are available for flies, slugs, &c., to feed on, and a fowlhouse regularly cleaned is not subject to heavy infestation of flies, while a yard free from rubbish and tufts of grass offers little harbourage for slugs.

Various treatments are recommended for freeing fowls of tape worms. Priority, however, is usually given to kamala. Kamala may be obtained in tabloid form and each bird may be treated individually, or the specific may be given in the mash at the rate of 15 grains per bird. Kamala is most unpleasant to handle, being very irritating, and any person who uses it for flock treatment should smear his hands and arms with grease before incorporating it in the mash. Farmers who have tried kamala in a wet mash state that birds do not relish their meal, and if the flock to be treated is not too large the tabloid form of treatment should be practised. It is certainly efficient and worth the labour entailed.

WEIGHT OF CREAM AND MILK.

What does a gallon of cream and a gallon of milk weigh? There is no legal weight for a given measure of cream or milk. It is generally accepted that a gallon of milk weighs 10.32 lb., and a gallon of cream testing 31.5 per cent. weighs 10 lb.

As the test of the cream increases, the weight per gallon decreases; for instance, 25 per cent. cream will weigh 10.073 lb. per gallon, a 30 per cent. cream will weigh 10.017 lb. per gallon, a 35 per cent. cream 9.963 lb. per gallon, and a 40 per cent. cream will weigh 9.908 lb. per gallon.

While the quantity of cream decreases in weight as the test increases, this is not so with whole milk as it is delivered from the cow. This is due to the fact that as normal milk increases in the percentage of fat, the specific gravity (weight per a given volume) also increases. Although the butter-fat in milk thus lowers the specific gravity of milk, the other solids tend to increase the specific gravity, as it must be understood that as the percentage of fat in milk increases, there is also an increase of solids other than fat, but not in the same ratio as the fat increases.

The milk solids not fat increase with a higher percentage of fat to offset the effect of the fat, with the result that, as the fat percentage of a given quantity of normal milk increases, its weight increases also.

This explanation applies to normal milk of high or low tests as it is delivered from the cow, but would not apply to milk whose butter-fat content has been increased by the addition of cream. Milk is sold to consumers by a measure and not by weight. This procedure is carried out as a matter of convenience and it is, generally speaking, equitable and just.

Chemistry in Agriculture.

By E. H. GURNEY, Agricultural Chemist.*

THE advancement of agriculture is dependent upon the application of scientific principles, and chemistry has been a factor of very great influence in agricultural progress.

Chemistry is very closely associated with all the operations which occur in animal and vegetable life; therefore, it will be seen there are many lines upon which the subject of chemistry in agriculture could be discussed, but on this occasion only very brief mention can be made of the chemistry of one or two agricultural processes.

Considering in the first place the maintaining of soil fertility, it should be said that research into this matter includes investigation of the soil's physical and biological conditions, as well as chemical conditions. In fact, soil research has become such an extensive and specialised matter that publications dealing only with the matter of soil research are in circulation, such as the publication "Soil Science." Study of these matters aid in understanding the fundamental facts of soil fertility.

Composition of Soil.

The chemical analysis of soil shows that it is composed of organic and inorganic (mineral) matter, and upon the analyses of plant life is found to be composed of organic and mineral matter. These mineral ingredients in plants are obtained from the soil water taken up by the roots of the plants. Most cultivated soils contain total amounts of the mineral elements required by plants sufficient for very many crops, but it is fortunate that only very little of this total amount is soluble in the soil water at any one time. If there is sufficient amount of mineral matter in soil water successful crops result—provided other soil conditions are favourable. This sufficiency or otherwise is well shown in the case of a soil on which successful crops cannot be obtained, but upon this soil, after the application of, say, 3 cwt. of superphosphate per acre containing only 70 lb. of soluble phosphoric acid, very successful crops are obtained.

In the analysis of soils, weak solutions of various chemical substances are used for the determination of available plant-food.

The acidity of soil has been well investigated by chemists, and quite a number of methods for its determination are available.

Soil Acidity.

The acidity of soil is of complex nature, but here it may briefly be said to comprise organic and mineral acidity. Organic acidity does not appear to have ill-effect upon plant life to the same extent as mineral acidity. Soil is also considered from its pH—that is, the degree of hydrogen ion concentration of the soil moisture.

Lime is used to rectify excessive soil acidity, but at times both lime and lime phosphate are used. Different plants are not affected in the same way by the application of lime to the soil; thus lucerne for its most successful growth requires a plentiful supply of lime, whereas it has been reported that peanuts are ill-affected by liming. It may be

* In a radio lecturette from Station 4QG.

mentioned here that, besides neutralising acidity, lime improves the mechanical condition of the soil.

The humus (decayed organic material) of soil has been subjected to very extensive chemical research. All the beneficial effects from the presence of humus in the soil cannot be stated now, but it should be said that the maintaining of sufficient supplies of humus in Queensland soils is one of the most important agricultural problems.

As is well known, farmyard manure supplies humus to the soil, Chemists have discovered means of preparing what may be called artificial or synthetic farmyard manure. The results of experiments conducted by Hutchinson and Richards at Rothamsted on the conversion of straw into a manure similar to farmyard manure were published in 1931, and further investigation has resulted in a patented process known under the name of "Adco." It is considered that ultimately the synthesis of humus from crude vegetable matter will be a matter of general practice.

Maintenance of Soil Fertility.

The application of artificial fertilizers is one means of maintaining soil fertility, and it is owing to chemical research that the present-day artificial fertilizers are in existence.

In 1842 Sir John Lawes took out a patent which covered the manufacture of superphosphate. The patent was based on the fact that when bone dust or rock sulphate was treated with sulphuric acid the insoluble phosphoric acid was converted into a soluble form. This may be taken as the initial step in the evolution of the present-day huge "artificial fertilizer" industry, and which has only been made possible by means of extensive chemical research.

Of the usual ingredients in artificial fertilizers nitrogen is of particular importance. Nitrogen exists in the proportion of about four-fifths in the atmosphere, but it is a very inert gas, and in the earlier days of the fertilizer industry there were no means of fixing the nitrogen of the air. But now chemists, with the assistance of engineers, have discovered several different methods by which nitrogen of the air can be made to combine with other elements on a commercial scale.

Briefly, some of these methods are the combination of nitrogen and oxygen at the very high temperature obtained by an electric arc, with the ultimate formation of nitric acid and then calcium or ammonium nitrate; the fixation of nitrogen by passing it over heated calcium carbide resulting in the formation of cyanamide (containing about 60 per cent. nitrolime); the treatment of calcium cyanamide to cause production of ammonia. Such processes as these have certainly lowered the price of nitrogenous fertilizers, but nitrogen is still the dearest fertilizing ingredient to buy.

Chemistry and Crop Production.

Chemistry has been applied to problems in connection with crop production, and the composition of healthy plant growth, as revealed by chemical analysis, indicates to a certain extent the amounts of plant-food required by such plant growth; but it must be remembered the composition of the plant varies at different stages of growth. The analysis of the ash of different crops shows that though the crops all contain practically the same mineral matter the proportion in which the different

elements are present may vary to a considerable extent. In the case of poor crops production, chemical investigation of the soil will frequently show the reason of crop failure.

Animal Nutrition.

In connection with animal nutrition, it may be said this is a matter entirely of chemical nature, for the food consumed by an animal is converted by chemical processes in the animal's body into substances capable of being assimilated by the animal. It will, therefore, be understood that it is only by chemical means that some knowledge has been gained concerning the nutrition of animals.

Analyses of very many of the foodstuffs of animals have been made showing the different nutrient ingredients contained in them. But this is not sufficient, as animals can digest more of some of these ingredients than others, and still further an ingredient in one food may be more easily digested than when contained in another foodstuff. This complication has been met by the chemist determining the digestibility of each nutrient ingredient in many foodstuffs. Briefly stated, the determining of the digestibility of a foodstuff is accomplished by analysing the solid excreted fæces produced from a known amount of foodstuff consumed. The digestibility of food determined in this way has been performed mostly by European and American investigators. The results obtained are termed "Digestibility co-efficients." The animal derives its energy from the food and a certain amount of this energy is required for mastication, digestion, &c., and this energy is deducted when the value of a food for production of milk, &c., is estimated.

It will be seen that animal nutrition is a complicated chemical process, and it is necessary when evaluing foodstuffs to have a means which will take into account these different requirements of the animal. Such terms as "Strach equivalent," "net energy," and "calories," denote the method by which the value of the food has been calculated.

Chemistry and Agricultural Progress.

Only a few items have been quoted as illustrating the assistance that the science of chemistry gives to agriculture, but brief mention will now be made of how chemistry assists agricultural advancement in being what may be termed a protective factor.

For the protection of the agriculturist the Governments have passed different Acts, such as the Fertilizers Act, the Stock Foods Act, the Pest Destroyers Act, and the Veterinary Medicines Act. These Acts provide that any commodity which is covered by any of these Acts must when sold have a label attached stating the composition of the material in so far as the active ingredients are concerned. Samples of material coming under these Acts are obtained by inspectors of the Department of Agriculture and forwarded for chemical analysis for the purpose of ascertaining if the samples are in accordance with the guarantee.

The buyer of material sold under these Acts may have it analysed, providing that the sample is taken and forwarded in accordance with the methods set out in the Act.

Seasonal Notes on the 1933-34 Cotton Crop.

R. W. PETERS, Cotton Experimentalist.

THE cotton season which is now approaching its final stage has been a peculiar one in several ways, and with its peculiarities new problems have resulted, the explanation of which in some cases is simple of interpretation, while in others further investigations are likely to be required, in that most unusually heavy winter rainfall was experienced in all districts except the southern. While this allowed of a welcome replacement of subsoil moisture following on three years of low rainfall, the preparation of the seed-beds was considerably handicapped, especially in the Callide Valley, where the showery conditions continued up to the normal planting time. The main cotton districts were, therefore, planted under most unusual conditions for Queensland, all the land being well soaked, with ample subsoil moisture, and in many cases ploughing was delayed by wet conditions.

General planting rains occurred by the end of September or early in October, and at frequent intervals from then on to the end of November, giving a wide range of time for planting and thus enabling late prepared seed-beds to be planted in good condition.

These conditions caused severe loss of stands in some districts, especially on clay slopes where heavy storm rains were responsible for the washing out of seeds, and in some instances, beating the soil surface so hard as to form a crust, thereby preventing germination.

The main problem confronting the average cotton farmer at this stage was that of weed control, the weeds coming up soon after the cotton rows appeared. The necessity of early cultivation so frequently advised by the Department of Agriculture and Stock was demonstrated in all districts to no small degree, and the results obtained by farmers who carried out this operation clearly illustrated the necessity and wisdom of early cultivation.

The practice recommended by the Cotton Section of the Department of Agriculture, as tested over a period of years at the Cotton Research Station, is to cultivate as soon as possible after the row of young plants is discernible, as this creates a mulch around them and destroys any young weed and grass growth. Riding cultivators, equipped with tines and fenders, are undoubtedly the most efficient implements to use for this operation, but cross harrowing can be substituted if the land is clean of trash, such as old corn stalks, &c.

This initial cultivation, if carried out properly, has a most important bearing on future operations. Not only is hoe work reduced to a minimum where early cultivation is done, but having the field well cultivated and clean early in the season lessens the cost of thinning and the number of cultivations required to grow the crop successfully. Where the fields are cleaned early the usual dry weather at that time kills any uprooted weeds and grass seedlings, and a field in such condition can experience a fairly prolonged wet period without weed growth becoming excessive enough to affect cotton plants. A cultivation made at the first opportunity after any period of prolonged rains then easily controls the tender

weed growth and leaves the field in good condition. Undoubtedly cultivating as soon as the cotton plants are 2 to 3 inches high has a most important bearing on the cost of production and the yields realised, and growers should pay greater attention to carrying out this operation.

Conditions for successful cotton growing continued generally in all the main areas until after the early January rains when hot dry weather prevailed.

In the Southern and South Burnett areas many cotton crops suffered through growers not cultivating immediately after this rain. In some instances this was due to the farmers being engaged in lucerne harvesting, while in others it was thought that the plants were too high to cultivate. The omission of this cultivation has proved to be expensive in most instances, for a hard crust set in the following hot dry period, which not only checked the development of the plants but later allowed the soil to crack badly and thus lose a lot of moisture. Growers must realise that the maintenance of a mulch as long as possible is necessary in the cotton crops. The best soils for cotton production appear to be the clay loams, and where crusts set on these before the plants are so tall as to provide sufficient shade, excessive loss of moisture occurs. Cultivation can be maintained in very tall cotton if done with a walking scuffler drawn by one horse harnessed with long traces and a short spreader. Undoubtedly cultivation should be continued much later than is done by many farmers, especially those on clay loam slopes.

Had the cultivation referred to been carried out, thereby loosening the soil crust, the rapid evaporation of the soil moisture would have been lessened to such an extent that ample moisture would have been available for the roots to absorb a sufficient supply to meet its transpiration requirements.

It is interesting to note this season that cotton planted at the end of September or quite early in October suffered by far the heavier shedding of crop during January, whereas cotton planted later, from the middle of October, sufferéd relatively little shedding. The probable explanation is that the earlier planted cotton apparently suffered through setting a heavy early crop which proved too great a load for the plant to hold. In the case of mid-October plantings, these were not advanced to such a stage, and were able to withstand more effectively the hot dry period.

It would appear from this that mid-October plantings may be more advisable in most districts, as this procedure would tend to lessen the load of forms that the plants would have to carry during the usual stress conditions in January, and would also delay the opening of the lower bolls until after February, which is often a very wet month.

Picking conditions are generally ideal during March and the rest of the autumn, so that higher grades would be obtained with the later planted cotton.

Similar observations were made in the United States of America a few years ago, where it was found that varieties which set the quickest crop of forms did not produce the heaviest crop. In other words, varieties which put on forms moderately early, but at the same time somewhat sparingly, so that there was a gradual accumulation rather than a rapid setting of crop, finally produced more cotton.

Diseases and Insect Pests.

Diseases and insect pests have not been responsible for any very serious loss this season. At the commencement cutworms caused damage to the young seedlings only in isolated areas, and in many cases these were controlled by the paris green poison bait.

Terminal loss was in evidence again in most areas, and was probably caused by thrips, which destroy the terminal buds by sucking, forcing the plant to send out numerous vegetative branches and causing a bushy growth.

Cotton stainers have been scarce throughout the season with the exception of the false cotton stainer. This has been present in most fields throughout the season, and has in all probability been responsible for a considerable amount of shedding at different periods prior to the dry spell in January.

The corn-ear worm attacked cotton formations during January to varying degrees, and in the Southern area appears to have done considerable damage, probably assisted by a pest somewhat similar in its habits, the rough boll worm.

The only disease manifesting itself to any extent has been the angular leaf spot, which always makes its appearance after rain and has, therefore, under this season's conditions, been expected.

Crop Prospects.

Following the recent beneficial rains which were so urgently needed over the whole of the cotton belt to assist the development of the top crop, it appears probable that a record crop will be harvested. The quality of the crop, provided suitable harvesting conditions prevail, should show a marked improvement over that of the crops of recent seasons, when droughty conditions were experienced generally. It is to be hoped that a crop in keeping with the present prospective yield will be obtained. Not only would the financial condition of a large number of farmers be greatly improved, but a marked relief of unemployment would be afforded through the harvesting, preparation, and marketing of the crop and, in addition to this, a sum totalling several hundred thousand pounds would be distributed in the State from the realisation of the sale of the crop.

Cotton Growing on New Cultivations.

By W. G. WELLS, Director of Cotton Culture.

THE present phase of cotton growing in Queensland has now extended over roughly twelve seasons, which has been sufficient time to demonstrate the existence of several factors operating here in cotton growing, amongst which is the beneficial result that is obtained from growing this crop on land newly brought under cultivation. In the earlier years of this phase it was thought that cotton could be grown successfully on nearly any kind of soil, but the disastrous results obtained by many unfortunate farmers clearly demonstrated in most of the older cultivated areas a marked limitation of soil types having a high degree of suitability for producing profitable yields under a range of climatic conditions.

Better results were obtained generally in the districts of newer settlements, however, especially in the Upper Burnett-Callide Valley scheme, where cattle stations were opened for selection as agricultural farms in 1924. Demonstration areas had shown that cotton growing was eminently suitable for the general district, and the new settlers mostly concentrated on this crop. During the first few seasons good to excellent yields were obtained, as much as 1,900 to 2,000 lb. seed cotton being realised per acre. Owing to limited capital and the cost of clearing the heavily timbered alluvial country, cotton was grown continuously for several years on the same land, and after a few seasons it became clearly evident that the yields were declining on most of the soils. Less favourable seasons and insect attacks were at first thought to be responsible, but examinations of the soils indicated that changes occurring in their physical and chemical composition were the contributory causes, although the seasonal conditions and insect attacks were the direct agents.

Nitrate Content of Soils.

It was at first thought that the increasing of the nitrate content of the soil with each season's cultivation was the explanation of the rank growth being obtained. These growths were generally attacked by the corn-ear worm to such an extent that little or often no crop was produced. Examinations of some soils showed that the nitrate content in the initial determinations, expressed in parts per million parts of soil, ranged from 7 to 15 parts in new cultivations to 30 and 40 parts in six or seven-year old cultivations. As nitrogen is the plant-food which is necessary to promote good growth of plants, it can be appreciated how the marked increase in nitrates would tend to stimulate rank growth on the richer alluvials.

It was also ascertained that the carbon content of the older alluvial cultivations was being lowered with the continuous cultivation. Carbon is the basic material of all organic matter, such as roots and parts of plants, grasses, &c., so that the depletion of the carbon and the increase of the nitrogen content brought about a lowering in the ratio of carbon and nitrogen. This ratio is a very important factor in promoting the growth and fruiting of a cotton plant, and as the ratio apparently lessened in some soils by as much as 40 per cent., the effect on the soils of the continuous cultivation can be understood.

Effect of Carbon-Nitrogen Ratio.

The effect of this change in the carbon-nitrogen ratio of the soils and the increase of the nitrate content is to make the plants grow rankish with a light amount of fruiting during wet periods. These periods frequently coincide with the occurrence of large populations of corn-ear worm moths, which often find the tender rank growth of the cotton plants attractive places on which to lay their eggs. The resultant broods of young corn-ear worms rapidly destroy first, the young squares, and then later the young and even nearly matured bolls during the latter stages of the life of the grubs. With the removal of the load of squares and small bolls, the plants on the soils with higher nitrate content and low carbon-nitrogen ratio tend to make very rapid development of rank vegetative growth, which becomes all the more attractive to insects later in the season, and often no yields are harvested.

Examinations of crops on new cultivations adjacent to old ones have shown that the plants on the new cultivations can be attacked fairly heavily by corn-ear worm and other pests causing similar damage, and yet good yields can eventually be obtained. Apparently on such crops the proper carbon-nitrogen ratio and the nitrate content of the soils prevent rank growth, and as soon as the attack is over, if climatic conditions are at all favourable, the formation of squares is quickly started and a profitable load of fruit is soon developing, especially where a variety with the ability to produce a heavy top crop is being grown. This phenomenon has been observed many times in all the cotton-growing districts over a series of seasons, so that it undoubtedly pays better to grow cotton on the newer cultivations than on the old ones, particularly on the alluvial heavy loams and clay loams.

The following results, obtained at the Cotton Research Station in the Callide Valley, illustrate very well the gains which may be realised by planting on new cultivations on the more fertile loams:—

	Series J.	Series K.
Average yield in lb. seed cotton per acre from one-year old cultivation	917	1,171
Average yield in lb. seed cotton per acre from four-year old cultivation	501	475
Average yield in lb. seed cotton per acre from eight-year old cultivation	251	436
Gain in favour of new as compared to eight year old cultivation	666	735
Gain in favour of new as compared to four-year old cultivation	416	696

It will be seen that a heavy decline in the yielding ability of the soil occurred with four years of continuous cultivation of cotton.

Moisture Penetration.

Soil moisture studies made at the Cotton Research Station have thrown further light on the problem of why the cotton crops produce heavier on the new than on the old cultivations. In the 1932-33 season it was ascertained that a fall of 2·94 inches—occurring in two storms, one late in the evening followed by the other early next morning—failed to increase the soil moisture content at the 4 to 6-inch level on well-mulched old cultivation to any appreciable extent. An experiment in the following season, in which the rate of penetration was studied of a

continuous rain yielding 2·46 inches and lasting over twenty-five hours, established the fact that only 35 per cent. of the rain penetrated into the first 18 inches of soil in the old cultivation, as compared to 74 per cent. in the new. Studies made at the Missouri State Station, in the United States of America, have likewise shown a marked difference in the run-off of rains in favour of the more open soils or soils cropped with grasses, cereals, &c.

It would appear, therefore, that greater penetration of rains, especially beating severe storms, will be obtained in the newer cultivations. This is probably another explanation of why heavier yields of cotton are produced on the new cultivations, for with the better and quicker penetration that occurs in such soils there will be a greater washing down of the soluble nitrate, and thus there will be less of them available for the upper root system of the plants while the soils in this area are thoroughly moist. As the greater proportion of the lateral root systems of cotton plants on most of the best cotton soils in Queensland, which are of a heavy clay loam nature, occur in the first foot of soils, the lessening of the nitrates in this area must help materially in controlling plant growth during wet periods.

It is recommended, therefore, that cotton be grown only a few seasons in succession on new cultivations, and then a fresh area of suitable soil be prepared. The most suitable and unsuitable soils for growing cotton in Queensland have already been described in "Cotton Growing," a copy of which may be obtained from the Department of Agriculture and Stock, Brisbane.

Methods of Improving Soils.

It is obvious that on most farms the bringing in of new cultivation for cotton growing cannot be continued for many years, owing to limitation of area. Rotation of crops must, therefore, be practised. A wide range of studies of the suitability of various crop rotations have, therefore, been instituted at the Cotton Research Station to ascertain if it is possible to obtain the same results by growing cotton in rotation with other crops as are realised on new cultivations. Some gains have been obtained through following maize, panicum, and also two cereals, such as wheat followed by maize, especially when the cotton crops have been grown in dry seasons and the cereals in wet ones. Likewise, following fallow has proved beneficial in dry seasons. No results have been secured, however, which would indicate that any of the rotations of cotton and ordinary farm crops will give, over a series of seasons, yields comparable to those usually obtained when cotton is planted on new cultivations.

The good yields of cotton which are generally produced, when brigalow scrub clay loams are stumped, following several years of Rhodes grass, have led to extensive studies being carried out at the Research Station of the possibilities of using Rhodes grass to reduce the nitrate content of the old cultivations sufficiently to reproduce the results that are obtained during the first few seasons of cotton growing on new cultivations. These have not been in progress long enough to allow of definite conclusions being made, except that soil analyses have shown a substantial reduction in nitrates is obtained after two years' growth of Rhodes grass. Instances have been seen, however, in other districts, where cotton following several years of Rhodes grass on rich brigalow clay loams, has produced good yields, although all other cotton fields in the same immediate area have had their yields seriously

reduced through corn-ear worm attacks, which is a common experience on the old cultivations of these districts. In such areas maize, during the first two crops following Rhodes grass of several seasons' growth shows every evidence of a lack of nitrates. With further seasons of cultivation this condition changes and good yields are obtained.

It would appear, therefore, that a Rhodes grass-cotton rotation may be the logical way to overcome the problem that confronts the cotton growers on the older cultivations. This grass is an excellent pasturage for dairy cows, and would, therefore, be valuable to the average cotton growers who also engage in dairying to an appreciable extent. A field of old cotton cultivation could be sown to Rhodes grass and left for three or four years and then planted to cotton for three seasons, when it could be resown with Rhodes grass. Such a rotation would be cheaper and require less labour than where fodder crops are resown annually, and in addition, both excellent pasturage and hay of high-feed value could be obtained.

Rhodes Grass Suitable for Forest Soils.

The idea prevailing in most districts that Rhodes grass does not do well on forest soils has not been borne out at the Research Station. An 11-acre field of very droughty sandy clay forest soil, where summer-grown crops produced very low yields, has given excellent pasturage for seven years to as many as fourteen heavy draught horses a season, through proper rotational grazing.

No difficulty need be feared regarding the controlling of the Rhodes grass seedlings during the first season of cotton cultivation. It has been found at the Research Station that two ploughings with a thorough harrowing after the planting rain prior to sowing the cotton, and then cultivating as soon as the rows of cotton are discernible, allows of easy controlling of future growth, if ordinary practices of good cultivation are followed.

Time of Breaking-up New Cultivations.

It is recommended that the first ploughing of the new cultivation, or of the Rhodes grass on old cultivation, be done prior to the June rains if possible. This will allow of a good penetration to the lower subsoils being obtained which will be of advantage during later dry periods. Experiments at the Research Station have demonstrated that a gain in moisture, equivalent to at least 1 inch of rain, has been obtained in the first 18 inches of soil by ploughing before the June rains. This additional moisture not only has maintained good growth of the cotton plants during adverse periods, but has actually saved the crop under drought conditions in the early stages of growth. A cross-ploughing after the June rains will then leave the soil in excellent condition for preparing a firm, moist seed-bed.

Rate of Planting on New Cultivations.

Owing to the more open type of surface of the seed-bed in the new cultivations, or in fact following Rhodes grass and any fodder crop, it is advisable to plant cotton at a heavier rate than is satisfactory on old cotton cultivations. Experiments have demonstrated that when planting under favourable conditions at a rate of 15 lb. per acre of delinted seed, in rows 4½ feet apart, an appreciable gain in number of seedlings per foot of row can be obtained in favour of the old cultivation. Under conditions of light planting rains an even greater difference may result.

Conclusions.

Cotton growing has been carried out long enough in most of the main cotton-growing districts of this State to develop problems, amongst which is the low yield often produced on the older cultivations. Good and excellent yields are obtained on soils freshly brought under cultivation in these areas, but with continuous cotton growing the yields decline seriously. Rotations with the various fodder and grain crops that can be grown in most of the cotton-growing districts, while indicating some improvement in yields can be obtained, especially in dry seasons, have failed to produce the differences in yields that usually result where cotton crops on old and new cultivations are compared. Results secured by farmers in different districts indicate that a rotation of three or four years of Rhodes grass followed by, say, three cotton crops, may prove to be the most profitable rotation that the farmer who grows cotton and engages in dairying can follow. It is recommended, therefore, that every grower test out the suitability of this practice to his soils. One thing is certain, however, if this rotation is not suitable other ones should be tried, for the continuous growing of cotton on the same land will not yield the maximum return it is possible to obtain on most soils.

FARM TRAINING.

Following is a reprint of a leading article in the Brisbane "Courier-Mail," 12th March, 1934:—

Not only in Queensland but throughout the whole world the agricultural industry is in an intensely serious position. Among the industrial population of the towns there is a popular belief that farmers are by nature, and almost by profession, confirmed grumblers. Possibly there is some truth in the statement, as many of them would admit. Unquestionably, however, the farmers are facing to-day the full force of the blizzard of depression which has been sweeping throughout the world, and it has struck them just as other sections of the community are beginning to emerge from it. The wheatmen, the dairymen, the fruitgrowers, the poultry-breeders, and even the market gardeners are getting for their produce less than its cost of production. This is due not to any local cause, but to the tragic fall in prices in the markets of the world, and the effect is being felt by farmers in every country. In France, within the last two months, millions of bushels of surplus wheat have been fed to stock; and, as suggested in the "Courier-Mail" a few days ago, it may be a good deal better for local farmers to feed their surplus wheat to stock and to poultry than to sell it at a ruinous price in London. The position of the dairymen and the fruitgrowers is equally precarious, and likely to remain so until the nations of the world realise that they must drop their intense nationalism and adopt a policy of trading co-operation.

Queensland is an essentially pastoral and agricultural community, and we cannot afford to be pessimistic about those industries because they are going through a world depression which, let us hope, is coming to an end. As the Minister for Agriculture said in an article in the "Courier-Mail" last Saturday, if we were to admit that the limits of production had been reached there would be no hope for Queensland or for Australia. Queensland's future depends upon the development of its pastoral and agricultural industries, wisely controlled and administered. It would be well if farmers would accept as a sincere statement of fact the assurance that the Government is endeavouring to assist them in every possible way, and that in training lads for agriculture it is thinking of the future. No good service could be gained by ignoring the seriousness of the present position, but it would be a policy of sheer despair to neglect the future or to discontinue the training of farm lads. As Mr. Bulcock said in his article on Saturday, the time has gone when the farmer was a "way-back"; he must now be a trained man, combining practical and scientific knowledge. For such men, despite the present position, there is an immense future.

New Director of Fruit Culture.

MR BARNES' CAREER.

MR. HARRY BARNES, Instructor in Fruit Culture, has been appointed Director of Fruit Culture in the Department of Agriculture and Stock, in succession to the late Mr. George Williams.

The new chief of the Fruit Branch was born in Maryborough, Queensland, in 1904, and was educated at the Christian Brothers High School in that city. After passing the Junior University examination he received an appointment in 1920 to the Department of Agriculture and Stock, and gained administrative experience in different branches of the Department. For two years in succession he served with the Central

Plate 111.—Mr. H. Barnes, Director of Fruit Culture, who has succeeded the late Mr. George Williams.

Sugar Cane Prices Board, accompanying the Board on its annual tours of duty throughout the canegrowing districts of the State. In 1924 he was transferred to the Fruit Branch to perform secretarial duties for the then Director of Fruit Culture, the late Mr. A. H. Benson, M.R.A.C., and was subsequently appointed secretary of the Committee of Investigation into the bunchy top disease of bananas.

In 1926, Mr. Barnes passed the Fruit Inspectors' examination, in which he secured first place; and in 1929 he passed the Fruit Instructors' examination. During the last three years he has been associated with the direction of his branch of the Department; and for the past year he has been carrying out the duties of Director of Fruit Culture in an acting capacity. On his recommendation the following schemes and experiments have been put in hand by the Department:—A citrus budwood scheme designed to improve the standard of the citrus fruits produced in the State. Regulations for the better control of banana diseases (such as bunchy top and beetle borer), and for the more efficient control of fruit fly in deciduous fruits. The inauguration of maturity standards for citrus fruits and grapes. The conduct of experiments to ascertain the relative merits of muriate and sulphate of potash when applied to pineapples. The establishment of a citrus fertilizer plot, for the purpose of bringing about an increase in the bearing capacity of low-bearing trees. The establishment of a Queensland Nut experiment plot at St Lucia. Experiments with the object of determining the most suitable stocks for citrus trees in the various soils in different districts. Experiments with dates and olives in Western Queensland. Experiments to determine the storage life of lemons.

In addition to gaining a wide knowledge of field practice and problems, Mr. Barnes has pursued a course of study bearing on the scientific side of fruit culture at the Queensland University; and has also, as chairman of the Banana Industry Protection Board and deputy for the Director of Marketing on the Committee of Direction of Fruit Marketing, gained a sound knowledge of the economies of the industry.

TO FAIL AT DAIRYING.

There is a variety of practices conducive to failure at dairying. The following were enumerated in an American paper some years ago, but they may still be relied on:—

Buy any old cow, so long as it is a cow.

Buy the cheapest food, if any, regardless of its content.

Be careful not to test—your grandfather got along without it.

If the cows don't move smartly, prod them with a fork or milk stool—it brightens the animals up.

Milk and feed the cows when the notion strikes you or let them go over one milking; there is nothing in regularity.

Breed your cows to any sort of scrub bull, no matter of what breed, so long as they will freshen once a year or so.

Use luke-warm or cold water for washing dairy utensils (if you must wash them)—it is less hurtful to the germs that lower the quality of dairy products.

On no account wash your hands whilst milking—detrimental bacteria like dirt.

Persevere with these methods—you can depend upon them breaking you in the end.

Strawberry Culture.

Revised by H. BARNES, Director of Fruit Culture.

ALTHOUGH the strawberry is commonly considered to be better adapted to the climate of the temperate zones than to that of the semi-tropics, it is, nevertheless, the one berry fruit which can be grown to perfection in this State. Excellent fruit is produced in our Southern coastal districts and even under tropical conditions such as those existing at Townsville, when the plants are grown on alluvial soil and are well irrigated, very good fruit is produced. This shows that the strawberry has a wide range in this State and that it can be grown successfully over the greater portion of our Eastern coastline and the tableland country adjacent thereto, provided there is either an adequate rainfall or, failing that, a supply of water for irrigation.

The commercial cultivation of the strawberry is, however, confined mainly to those districts possessing a regular rainfall, and extends from the Redlands Area in the south to Bundaberg in the north. When grown under suitable conditions in this district, the strawberry has proved itself to be an early and prolific bearer, able to stand a fair amount of hardship, in the shape of dry weather, and to resist the attack of insect and fungus pests to a greater or less extent.

There is a good demand for the fruit, either for immediate consumption in this and the Southern States or for conversion into jam, and, as few crops yield a quicker return, it frequently enables a beginner to make a living whilst more slowly maturing fruit crops are coming into bearing.

Our strawberries are of excellent quality and carry well, so that they reach their destination in the Southern States in good order when carefully handled and packed, provided the weather is not excessively warm or the fruit over-soft on account of excessive rainfall. The fruit is very suitable for jam, and the product of some of our local factories is not excelled elsewhere in the Commonwealth.

Soils for Strawberries.

Given suitable climatic conditions, strawberries will thrive in most soils, but the ideal soil for this fruit is a rich loam of medium texture, well supplied with humus, possessing perfect natural drainage, and capable of retaining moisture during dry spells—and the nearer one can get the soil to this ideal the better the results. Heavy, cold, badly-drained soils are not suitable, but any good loam or sandy loam, whether of scrub or forest origin, can be made to produce good berries if properly treated.

Preparation of the Soil.

There is only one way to prepare soil for strawberry culture, and that is—*thoroughly*. Nothing else will do. In the case of virgin scrub or forest land, which is, as a rule, fairly rich in humus, the land, after it is cleared, should be broken up deeply and brought into a state of as nearly perfect tilth as possible. On virgin soil, except it is of the poorest nature, it is not necessary to apply any manure for the first crop, as there is usually an ample supply of available plant-food and humus present in such soil, but for subsequent crops, or old land, systematic manuring is very important. Old land that is at all deficient in humus should have that deficiency made good, either by the application of a heavy dressing of farmyard or stable manure, such as a load to every

4 perches, or if this cannot be obtained, then by growing a green crop such as cowpea or other legume which has been well manured with phosphatic and potassic manures and ploughing it in. The green crop so ploughed in should be allowed to rot and, when rotten, the land should be reploughed and worked down fine. If the green crop has received a generous dressing of phosphatic and potassic manure, then there will be no need to apply any further fertilizing material to the land, as a complete manuring has been given; but if not, then the soil should be treated as recommended later on.

The surface of the land should be kept as even and level as possible, and, as already stated, it should be worked down fine, so that when the young plants are set out they will take hold of the soil at once and become firmly established.

Planting strawberries on raw land, sour land, or land that has been indifferently prepared is only courting failure, whereas, when the planting is carried out as advised, there is every chance of success.

Selection of Plants.

Always obtain strong runners from healthy, prolific plants. The first runners next to the parent plants are to be preferred, as they are usually the most vigorous and best rooted, and, further, they come into bearing earlier; but, failing these, well-rooted, strong, well-grown runners from nearer the tips can be used, and although they will not fruit as soon as the first runners they will give a good yield later on, and frequently continue to bear when the earlier fruiting plants have ceased.

Planting.

March and April are the main planting months. Having secured suitable plants trim the roots with a sharp knife to about 3 to 4 inches long, taking care not to let them dry out. Spread the roots evenly when planting and leave the crown of the plant just above the level of the ground. In the following illustrations No. 1 shows a plant set too

No. 1.

No. 2

No. 3.

No. 4.

PLATE 112.

deeply; in No. 2 the roots are all bunched together so that the plant has not got a firm hold on the ground. No. 3 has been planted too high, whilst No. 4 illustrates the correct depth at which to plant and the manner of spreading the roots.

Plants are usually set with the hand or with the aid of a trowel or dibble. A planting wire is useful aid in keeping the rows straight.

Careless planting is responsible for many failures, especially too deep planting, as no strawberry will thrive if its crown is buried under the soil.

The distance at which to set out the plants varies somewhat in different districts, but it is not advisable in any case to overcrowd them, but to allow plenty of room; 20 inches to 2 feet apart each way is a favourite distance, so that the land can be worked all round the plants, or if row planting is desired, then the rows should be about 30 inches apart and plants set out at from 15 to 18 inches apart in the row. The illustration of a strawberry garden shows the manner of planting adopted by a most successful grower, and it will be noted that the plants have plenty of room and are in no way overcrowded.

Cultivation.

Strawberry plants must only be surface-worked whilst growing or bearing fruit. The object is to keep down weed growth and to prevent the surface of the soil caking; but the cultivation must never be so deep that it will injure the roots. The best implement to use is the Planet Junior hand cultivator or similar machine; or, failing that, a good Dutch hoe of any type that may be preferred.

Weed growth must be kept down and the surface of the soil must not be allowed to become hard and set, as if it does the evaporation of moisture from the soil will be greatly increased, and it will dry out rapidly.

If the plants are to be kept over for a second or third year, then the whole of the runners, other than those required to make good any losses in the original plants, must be removed throughout the season, and the ground between the original plants must be well broken up and manured in late summer or early autumn, so that the plants will be in good heart for producing a crop of fruit the following season.

If the plants have been badly attacked by leaf blight it is a good plan to cut off all the leaves and burn them prior to working and manuring the land, as numerous fungus spores are destroyed thereby. The burning off is best done by scattering a little loose dry straw over the plants when the leaves have been cut off and have dried, and then setting fire to the lot. A light burning does not injure the plants, but is decidedly beneficial.

Mulching.

Mulching is seldom practised in this State, probably owing to the fact that a really good material for mulching is not readily obtainable, and therefore a light soil mulch produced by the surface working of the soil by means of a Dutch hoe, Planet Junior, or similar hand cultivator is all that is necessary. The use of a paper mulch has, however, much to recommend it, as it would certainly keep down weed growth and tend to maintain even soil conditions. A strip of paper mulch 18 inches wide

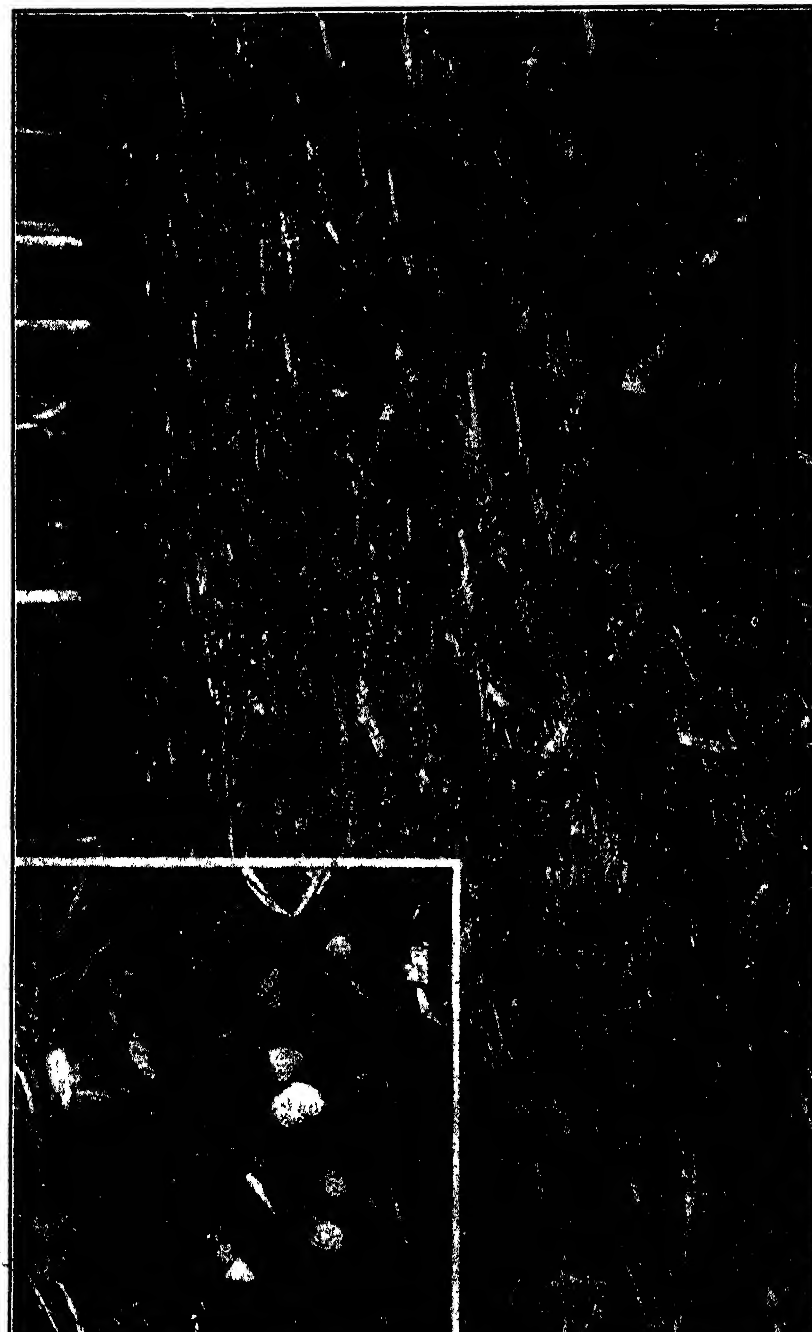

Plate 113.—A Strawberry Garden on the near North Coast.

would be all that is necessary, and the plants should be set through the paper at from 15 to 18 inches apart in the row. A further advantage to be derived by the use of paper mulch is that the fruit would be kept much cleaner, as it would not be so liable to be covered with dirt as frequently happens if heavy rain falls or the watering is not very carefully applied. Some growers use dry grass or straw as a mulch and this practice is also considered a good one.

Irrigation.

Where water is obtainable it should always be available for the plants' use during dry weather, as the ability to maintain an adequate supply of moisture in the soil at all times and thus maintain an even growth will result in larger and better fruit, and a heavy increase in yield. Strawberries pay well for intensive culture, and the money expended in providing a good system of overhead or other method of spray irrigation will be found to be a very profitable investment. A combination of mulching and spray irrigation will enable a grower to maintain a regular supply throughout the season of first-class table fruit.

Manuring.

The strawberry is a fruit that requires an abundance of readily available plant-food, and one that pays well for systematic and judicious manuring. In the 1931 edition of his pamphlet, "Complete Fertilizers for Farm and Orchard," the late Agricultural Chemist to this Department (Mr. J. C. Brünnich) gives the following advice, which it will pay to follow:—

"Some of our coastal country, between the 26th and 28th degrees south latitude, is particularly suitable for strawberry culture, frequently producing quite phenomenal crops. Some of our rich loamy soils found in our coastal scrub lands give the best results. In poorer sandy soils the improvement effected by artificial fertilizers, particularly such containing potash, is very marked, and a light dressing of 5 to 10 tons of stable manure per acre is very beneficial.

"A complete fertilizer for strawberries of the formula 4-8-10 should be used at the rate of 5 to 9 cwt. per acre.

"The following fertilizer mixture may be found useful:—

1 to 1½ cwt. sulphate of ammonia, or nitrate of soda
3 to 5 cwt. basic or ordinary superphosphate
1½ to 2 cwt. sulphate of potash
} per acre;

or,

1½ to 2 cwt. nitrate of soda
1 cwt. fine bonemeal
4 cwt. superphosphate or Nauru phosphate
2 cwt. sulphate of potash
} per acre;

The latter applied by two or three top-dressings, at the rate of 1 cwt. per acre, when fruit is first forming, and thereafter at intervals of two weeks."

Green Crop Manuring.

When dealing with the preparation of the soil, the importance of providing an adequate supply of humus was referred to, and the statement made that where a sufficient quantity of farmyard manure was not

available to supply this essential ingredient to the soil, green crop manuring should be used to make good the deficiency. Humus plays a very important part in the composition of soils, and especially so in those devoted to strawberry culture, as its presence in the soil enables it to retain a much larger percentage of moisture than it would do were it deficient in humus. The power to retain moisture is of the greatest importance in a soil devoted to strawberry culture, as the strawberry is a shallow-rooted plant that soon suffers when there is any lack of moisture.

Moisture in the soil also enables the artificial fertilizers applied to become available, as they are of no use whatever to the crop unless their plant-food is capable of being dissolved by the soil moisture, and can thus be obtained therefrom by the roots of plants. When leguminous crops are grown as a green manure they should be manured with a fertilizer containing lime, citrate-soluble phosphoric acid, and potash; such as a mixture of finely-ground island phosphate and a potash salt, used in the proportion of four of the former to one of the latter. No nitrogen need be applied, as the plants will obtain their own from the atmosphere; and when they are ploughed into the soil it will not only be enriched by the plant-foods contained in the fertilizer applied to the soil to produce the green crop, but also by the nitrogen that has been produced by the green crop itself; the whole forming a complete fertilizer, as it contains all the essential plant-foods in an available form. Green crop manuring is the cheapest way in which to apply nitrogen to the soil, so that, taking into consideration its value as a supplier of humus, it is of the greatest value when intensive cultivation is intended; and as the strawberry is a crop that demands intensive cultivation, its importance cannot be over-estimated, especially in soils that are deficient in humus. Cowpeas, Poona peas, vetch beans, small Mauritius beans, and the large black Mauritius beans are the best legumes for summer growth and vetches or tares and the grey or partridge field pea for winter.

Marketing.

Fruit for immediate consumption should be gathered whilst still quite firm. It should be carefully handled, graded for size and colour, and packed in boxes, trays, or punnets containing a single layer of fruit. It is doubtful if the methods of marketing the fruit in single layers can well be improved upon, as they are less likely to be bruised than if packed in several layers. Fruit for factory use is stemmed, placed in cans or other suitable receptacles, and forwarded as quickly as possible to the factory. Care in handling, picking, grading, or packing, always pays.

Diseases.

The most serious diseases of the strawberry in this State are those of fungus origin—viz., leaf scorch and eye spot.

A pamphlet dealing with the control of these diseases can be obtained from the Entomological Branch of the Department.

Varieties.

Although most of the standard varieties of strawberries have been grown in Queensland at one time or another, experience has shown that no one variety has proved permanent, but that it has been necessary to either raise new kinds from seed or to introduce them from elsewhere.

Varieties producing perfect flowers have proved more profitable than pistillate sorts and are therefore most commonly met with.

After being grown in this State for a few years most varieties become weaker in growth, more liable to disease, and less prolific, so that they have to be discarded. The introduction of new sorts is thus essential, and there is no better way of doing this than by raising local seedlings. Some of the best sorts ever grown in the State have been locally raised seedlings, of which the Aurie, Anetta, and Phenomenal are good examples, and there is no reason why sorts equal or even superior to these should not be produced. Of the well-known standard varieties, such as Marguerite, Trollop's Victoria, British Queen, Pink's Prolific, Federation, Melba, and Edith, and several others that have been grown from time to time in this State, few are now planted. Phenomenal (a Gympie-raised seedling) and Aurie, another variety of local origin, are now the varieties most commonly met with; other new varieties are being tested and some of them may prove to be adapted to our local conditions. The type of strawberry best suited to this State is a vigorous healthy grower—that is, a good bearer and producer or good coloured fruit of good, firm texture and fine flavour; a fruit that keeps and carries well, and that meets the requirements of both the fresh fruit trade and of the jam maker.

As strawberry seed is freely produced and readily germinates, raising seedling plants, which usually fruit the following season, is recommended. By careful selection there is reasonable possibility of effecting improvement on existing varieties. Seed should not be collected indiscriminately but from fruit freely produced on plants showing marked vigour.

FEEDING OF PIGS.

Feeding tests being carried out at the Animal Health Station, Yeerongpilly, in which fifty-five pigs from two months' old upwards are being fed on rations comprising cereal meal, protein meal, minerals, and protein supplements are of particular interest, in view of the comparatively low prices of maize and wheat. These grains and the meals resultant from grinding them are cheap enough to warrant special consideration in regard to their values as pig foods.

A prominent American authority recently stated that under present conditions in Ohio pigs can be fed most efficiently and cheaply by dependence principally upon corn supplemented by protein concentrates from both animal and plant sources, with a limited quantity of mineral matter. Emphasis is given to the value of feeding these different grains in self-feeders, specially provided for the purpose, similar to those in use in the Yeerongpilly experiments.

It is well to remember that the pig, by nature, is a consumer of concentrates; his digestive organs cannot utilise the proportion of roughage or fibre in the ration that milch cows require. Pigs cannot profitably consume more than 9 or 10 per cent. of fibre in their rations, although they will consume more if permitted, but the additional quantity is more or less wasted in the process of digestion.

Brood sows and mature stock may be fed more roughage and fibre than pigs being finished for market. That the system of marketing farm crops on the hoof is practicable is proved by the fact that seven of the corn-belt States in America comprise what is probably the greatest hog-feeding area in the world, the grains used being corn, wheat, rye, and barley, and their by-products.

In feeding these cereals and cereal meals protein concentrates are essential. Animal proteins are usually more efficient in proportion than those from plant sources, hence the world-wide preference for milk and milk by-products, and meat meal in particular. One per cent. of the ration may be mineral matters, such as sterilised bone meal, ground limestone, and charcoal. The addition of a small percentage of salt to the rations fed to pigs is payable where the rations are deficient in this mineral. The Yeerongpilly experiments will be watched with considerable interest by all engaged in the feeding and marketing of pigs.

Broom Millet.

Some years ago we were permitted to reprint a bulletin on broom millet by Mr. G. Marks (then Inspector of Agriculture, Hawkesbury Agricultural College), Manager of the Government Experiment Farm at Grafton, New South Wales, and published by the New South Wales Department of Agriculture. In response to numerous inquiries from different parts of the State on the cultivation, harvesting, and marketing of broom millet, it is deemed advisable to reprint Mr. Marks' bulletin again, although in a somewhat abridged form.—Ed.

Requirements of the Trade.

In the manufacture of brooms, three classes of brush are required, which are popularly known as "inside," "cover," and "hurl."

"Inside" millet is used for forming the inside of the broom, and is generally not more than 17 inches long.

"Cover" is the class used for covering the inside and also for forming the shoulders. It is longer than the former, and must be from 17 to 20 inches in length.

"Hurl" is the longest brush, ranging from 20 to 25 inches. It must also be fine and straight, and forms the outside covering of the broom. To give a nice finished appearance, only prime hurl can be used.

About 1½ lb. of brush are required to make an ordinary broom, and the three grades are used in about equal proportions.

The soil, climate, and methods of cultivation determine largely the quality of the brush, but in an average season there would be sufficient of each produced to satisfy the requirements of the trade. When grown under exceptionally favourable conditions, a larger proportion of long brush is produced. It may be used as covers, but owing to its length a certain amount has to be cut off, so that its use for this purpose causes unnecessary waste. On the other hand, a dry season will have the effect of stunting the growth, producing a large percentage of "inside" millet, which can only be worked in the inside of brooms. Manufacturers have consequently to purchase elsewhere to satisfy their requirements.

It is not intended to go into detail concerning the manufacture of brooms, as this does not exactly concern the grower. Manufacturers require certain classes, and the farmer should aim at producing those classes which invariably give profitable returns.

Fully 90 per cent. of the millet produced in New South Wales is grown on the rich alluvial lands of the North Coast; and on several of these rivers—notably the Hunter, Manning, and Richmond—the industry may be looked upon as lucrative and permanent. Many farmers have reported their success with this crop, and would not think of reverting to the far less remunerative occupation of maizegrowing. The raising of millet need not be confined to these districts, as, with the necessary care, and the aid of a few home-made contrivances, any land which produces 25 or more bushels of maize to the acre will yield profitable returns. On many of our western slopes millet should also thrive,

particularly in those localities where irrigation can be carried out. It is advisable, before entering extensively into the production of broom millet, to ascertain from agents or manufacturers the probable requirements of the trade, with the view of obtaining an idea of the prices likely to be obtained during the season. At the same time, should the prices fall after the crop is harvested, the millet may, if properly cured and baled, be stored for a considerable length of time without injury.

The following information may enable beginners in broom millet growing to avoid some common mistakes, and not to neglect any of the important operations which are essential to success:—

What Broom Millet Is.

Andropogon sorghum vulgare is a non-saccharine variety of sorghum. It is an annual, somewhat similar in appearance to maize while young; but it has thinner stems and narrower leaves, and, instead of having male and female flowers on separate parts of the plant, they are both found together in the brush at the top. The flowers are of two kinds—perfect and imperfect. The former are set directly upon the branch, and are accompanied by some of the latter, raised upon little stalks. The fine stems of the panicle or brush are the valuable portions; the other parts are incidental. The brush should be composed of seed stems, uniform in size, length, elasticity, and toughness, and of a nice bright colour. The soil and general methods of cultivation will largely affect the character and quality of the product, even though good seed be used. By long and careful cultivation and systematic selection certain desirable qualities have been developed and fixed, which remain only so long as the conditions which brought these changes about are reasonably observed. When a plant is grown for a particular purpose it should be the cultivator's aim to keep improving it in the direction most profitable to him. This necessitates a careful study of the plant and its requirements, and the conditions which make for its proper development. In broom millet it is not desirable to obtain a heavy yield of seed, a large development of stalk and leaf, or a sap full of saccharine material, but a special and unusual development of the long, thin stems of which the brush is composed. It makes very little difference whether a large plant is produced or a heavy crop of seed is obtained, provided these stems are long and fine.

Class of Land Required.

The soil requirements of broom millet are similar to those of maize. The best results are obtained from the deep, rich, well-drained alluvial lands of our rivers. It is, however, capable of adapting itself to a variety of conditions, and with proper care and attention, sandy and even gravelly soils, if thoroughly drained, will produce fair returns. Undrained lands make the working and cultivation more difficult; the growth is generally slow and uneven, and there is always the liability of the crop becoming stunted and diseased. To ensure evenness in ripening a soil uniform in character and fertility is essential.

Place in the Rotation.

In the general rotation on the farm, broom millet takes the same place as maize. It is not advisable to adopt the practice of growing it in the same piece of land continuously, unless suitable fertilizers are applied. It has been found, however, in dry seasons, that it does not thrive as well on land following millet as where the previous crop was

maize. The reason of this appears to be that, being more drought-resistant, it continues to grow, and thus exhausts the soil of its supplies of moisture and plant-food, when maize would probably cease growing. At the same time, as the brush is usually harvested soon after the flowers have set, the crop can scarcely be classed as a very exhaustive one, particularly if the stalks are cut down immediately afterwards. Where possible, it should follow a leguminous or root crop.

Preparation of the Land.

To obtain the best results, the land must be properly prepared and brought to a fairly fine tilth before sowing. The previous treatment should be such as would destroy weed seeds. The presence of weeds in the early stages seriously interferes with the growth and cultivation of the young plants. Deep ploughing is recommended. This not only ensures greater feeding room for the roots, but it also has the effect of increasing the moisture-carrying capacity of the soil—a fact which must always be remembered, especially in those districts where the rainfall is limited and irregular.

The nature of the subsoil must also be considered. Clays should not be brought to the surface, but can be materially improved by subsoiling. Ploughing operations should be commenced a couple of months before sowing time. This not only allows the land to sweeten by exposure to the weather, but all vegetative growth turned under is generally well decomposed by the time the second ploughing takes place. In early spring the land should be well fined down by means of the harrow, disc, roller, &c.

Sowing and Cultivation.

Sowing should not take place until all danger of frost is over and the soil is thoroughly warmed, so that the seed will germinate at once. September, October, and November are usually the best months. If planted too early, there is not sufficient heat in the soil to cause the seed to germinate, and it will either rot or the young plants will be so weak that the weeds will very quickly outgrow and smother them. It may be sown about the same time as maize, or two or three weeks later, with advantage. Drills 4 or 5 inches deep are struck out with a plough (a double mould-board one is preferable) about 3 or 3½ feet apart, and the seed planted along these by hand or machine. The latter is preferable, as it sows more uniformly; and, by using a fertilizer attachment, chemical fertilizers may be applied at the same time. An ordinary maize seed-drill, which sows and covers the seed in the one operation, is one of the best for the purpose. During hot or dry weather the seed should be sown soon after the drills are opened, and before the soil has had time to dry. When this system is adopted, hilling can be dispensed with. It prevents a great deal of evaporation from the soil by exposing a smaller surface. Besides this, the plants, having their roots deep in the soil, have plenty of support, and are not so quickly affected by dry weather. The amount of seed varies from 5 to 8 lb. to the acre. When the plants are 6 inches high, they should be thinned out to 3 or 4 inches apart for rich soil, and more space allowed each plant in poor ground. With good, clean, and evenly-graded seed, the sowing may be adjusted so that very little thinning is necessary, thereby saving a tedious and rather expensive operation. The quality of the brush is affected to a very large extent by the manner in which this thinning is carried out. If too much space is allowed, the plants grow very strong and vigorous

and produce brush which is coarse and unsuitable for market. On the other hand, if crowded too much they become very fine and weak. To obtain an even crop, it is essential to have uniform sowing and germination, and later on to thin the plants to a uniform distance. Some growers prefer to sow the seeds in "hills," 15 to 20 inches apart in the drills, leaving from six to ten stalks to each. The seed should be covered from ½ to 1 inch deep, the depth depending upon the character and condition of the soil. If it is dry, deeper covering is more necessary than would be the case if the soil were in a good moist condition. Where labour is scarce, several sowings should be made in succession to enable the grower to deal with his crop at regular intervals, and not have the whole area mature at the same time. Rolling the land as the seed is planted ensures a quicker germination and a better stand, particularly if the soil is a little dry. When drilled, the roller at the rear of the machine is quite sufficient. Should heavy rains fall after sowing, and before the seed has germinated, a light harrow should be used as soon as the condition of the soil will admit. When 6 inches high, the crop may be harrowed to keep the soil loose and to gradually fill in the drills, and thus destroy any young weeds. Broom millet makes rather slow growth for the first couple of weeks, and the cultivator should be kept going every fortnight or three weeks, to keep the surface soil loose and friable, to conserve moisture, and prevent weed growth, and in every instance after rains. For large areas, a two-horse spring tine cultivator may be used. When the crop is half grown, under favourable conditions cultivation may cease; in any case the surface roots must not be disturbed by cultivating too deeply. In moist and exposed situations the crop may be lightly hilled, as an extra support is necessary. It is during the early stages of growth that the cultivator is of greatest value, as the soil may then be loosened fairly deeply. The most critical period is when the heads are forming. If dry weather should set in then, the brush will be short and stunted. It may be necessary in some districts to sow early or late in the season so that the crop will not come into flower during such trying conditions. Where irrigation is practised, it is essential to plant in suitably graded land and convey the water by means of open drills between the rows. After each application of water, and as soon as the nature of the soil will allow, the soil must be well cultivated to prevent caking and to conserve moisture.

Manuring.

On soils that are somewhat poor, it is advisable to apply fertilizers. Such crops as cowpeas, field-peas, vetches, and clovers are suitable for green manuring, and may be ploughed under when they have reached the blooming stage or have been grazed off by stock. This latter system works well when mixed farming is carried out, and stock of different kinds are kept. Any vegetable matter should be ploughed under early, to give it ample time to decompose before sowing. Farmyard manure, if available, is also a first-rate manure to apply, as it not only supplies the elements required by the plants, but also improves the mechanical condition of the soil. Chemical manures are also valuable, and are very easily applied. Superphosphate, bone-dust, dried blood, and sulphate of potash will be found the most suitable. The quantities used for maize or sorghum will do equally well for broom millet. The following make

a complete fertilizer, and may be applied at the rate of 2 to 2½ cwt. per acre:—

Superphosphate	80 lb.
Dried blood	64 ,,
Bone-dust	50 ,,
Sulphate of potash	30 ,,

The manures should be passed through a sieve, to remove lumps and foreign substances that would prevent them from passing freely through the drills. They should be thoroughly mixed just before sowing, as, if mixed any great length of time before required, they are very liable to "set," especially if the weather is at all damp, and this necessitates breaking up and rescreening before use. It is impossible to state definitely what quantity of manure is required for each class of soil. Growers would do well to conduct experiments on a small scale with manure, mixed in varying proportions, and to notice which give the best results. Soils, even in one locality, often vary considerably in their chemical and physical characters, and by such tests the farmer may soon determine the most suitable mixture for his land.

An excessive dressing of manure tends to produce a strong coarse brush.

Bending the Heads Over.

The practice of bending the heads over is not carried out extensively in this State, and as a result a large amount of bent brush is sent to market, which can be used only as "insides" or "covers." In many parts of the United States of America this operation is never neglected. When allowed to grow in the natural way, a large percentage of the brush will spread out, and bend over on account of the weight of the seed, and this reduces its market value. This is especially the case if there is good rain when the brush is forming. The rapid growth causes the panicles composing the head to become tender, and unable to bear the weight of the growing seed. Strong winds, at this particular period, will also cause this, and grain-eating birds, when plentiful, are sometimes responsible for a great deal of damage. The illustrations show examples of the brush thus destroyed.

This loss may be prevented by bending the head over, and the weight of the seed in maturing will cause the brush to lie close and straight. The turning must be done between the joints or nodes, as if done on the joints the stem will snap and the top die off. The bending checks the flow of sap a little, but the growth in the head is not materially affected. This operation is performed when the seed is beginning to fill out, and the brush shows signs of spreading.

It should be understood that it is quite possible to grow millet without turning down the heads. Some of the best millet on the market is grown by farmers who do not favour the operation. At the same time, there are seasons when a fairly large percentage is completely spoilt, and such losses could have been prevented by the adoption of this system. The stalks are bent about a foot below the base of the head, and, if the plants are very tall, there may be two bends, as shown in illustration. The heads should hang clear of the ground, so that they will not be damaged by rubbing, or discoloured by the splashing of mud in rainy weather.

Harvesting and Curing.

No matter what care has been bestowed upon the cultivation of the crop, sound judgment must be exercised at time of harvesting. An excellent crop may be brought successfully as far as this stage, and yet the result be unprofitable on account of inattention to, or ignorance of, some apparently unimportant detail. The time to harvest and the various other operations required to prepare the millet for market are such as require some experience in order to do them properly. Even experienced growers are not unanimous on the point of when to harvest the brush, some cutting the heads when in blossom, and others harvesting later so as to obtain better developed seed possessing considerable nutritive value. The time to cut will depend upon the weather and the colour required. Manufacturers generally prefer a millet having a green tinge. It is then much tougher than when allowed to become nearly ripe. To obtain this green colour the millet should be cut when the seeds are in what may be called the dough stage. The brush is then fully developed, but the grain is soft. For some classes of goods a golden colour is preferred, in which case the crop is left till the grain is fairly firm. With a little experience it is easy to harvest a large area, and yet maintain a uniform tint. A strong knife (a pruning knife is very suitable) is used to cut the brush, and at least 6 inches of stalk should be left on. In dwarf varieties the brush should be pulled instead of cut. Select fine weather for this operation. Some growers bend the stalks of drills towards each other diagonally, about 2 or 3 feet from the ground, forming a sort of platform upon which the cut heads are placed to dry. Others cut the whole of the stalks, and lay the millet upon them.

Drying in the Field.

In this State the millet may be properly dried in the field during the greater portion of the summer months. Should thunderstorms occur, the brush must be placed in heaps and covered with tarpaulins, sheets of iron, or other material. The time required for drying depends upon the season, but still, with fine bright weather, two days should be sufficient. The brush must not be allowed to get wet, as rain or dew soon discolours it.

Drying under Cover.

The finest colour is obtained by drying under cover, or away from the direct rays of the sun. The millet is left a couple of hours in the field for some of the moisture to evaporate before being taken to sheds fitted up with racks one above the other, so that the brush may be spread out in layers about 3 inches deep. It must be turned regularly at frequent intervals, and when nearly dry may be placed in thicker layers. This method requires plenty of space and a good deal of attention, and it takes longer to dry.

Removal of the Seed.

The seed is removed by means of a hackler.

The machine consists of a roller studded with small iron spikes, mounted in a frame and made to revolve at high speed. A handful of the brush is held so that the roller comes in contact with the seeds, which are speedily stripped off. A firm at Morpeth specialise in millet machinery, and supply these in hand, horse, or belt power for about £4 10s. and £5 10s. respectively.

For small quantities a handy man can very easily make one, but it is best to purchase one, properly constructed, for treating large amounts.

Grading.

The grading of millet is most important, and must not be overlooked. While grading cannot be done so cheaply or expeditiously on the farm as in the factory, still, in the grower's "own interest, it is essential that some grading be done." It should be sorted into at least three classes —"Inside," "Covers," and "Hurl"; and any which cannot be honestly included in any of these classes should be discarded. Green and golden should also be kept separate.

Baling.

The various grades should be baled separately. For this purpose a press is required. One used for lucerne or other hay can be conveniently adapted for this purpose. It is important, especially where space is charged for in freight, to reduce the bulk as far as possible. The brush is laid with butt ends outwards and the heads overlapping in the middle. Battens may be placed on top and bottom of the bales, and when pressed the whole is secured by five fairly stout wires. The size varies with individual growers; but a bale 46 inches by 30 inches by 24 inches, and weighing from 300 to 400 lb., can be recommended. Each bale should be legibly branded with an indication of the quality. There are several styles of home-made presses in use, but one that is coming largely into favour is made on similar lines to a wool-press, having wire ropes and a lever.

Yield.

The yield ranges from 10 to 15 cwt. of clean marketable brush, and 25 to 30 bushels of seed per acre. The price of broom millet fluctuates considerably with the season; and while it may vary from £18 to £40 per ton, the general average for prime hurl may be set down at £30, cover millet at £25 to £30, and inside millet at £20 per ton. Should the prices, however, be somewhat low when harvesting takes place, the millet may be stored for any length of time without deterioration, and disposed of when higher prices are obtainable.

On account of the seed not being properly developed, it is best to consume it on the farm. Its value may be estimated at 4s. per 4-bushel bag.

Selection of the Seed.

Special attention must be given to the selection of the seed. That obtained in the process of stripping should not be used for sowing. The practice of using such would speedily lead to deterioration and the production of inferior brush.

Good reliable seed can only be obtained by sowing in special areas and allowing the plants to mature their seed naturally. Individual plants may be allowed to ripen their seed in an ordinary field, but there is always a danger of them being hybridised by pollen from plants having inferior brush. In any case, seed should be obtained from those which produce the best heads. By proper cultivation and selection the quality and yield of any variety may be improved. Where seed-eating birds are troublesome, it may be necessary to cover the heads with some light material, such as muslin, when the seed is commencing to fill out. The ends must be tied loosely round the stalk so as not to interfere with

the free circulation of the sap. After harvesting, the heads are thoroughly dried, threshed, cleaned, and kept in a place secure from weevils and damp.

Where the conditions for saving seed are not suitable it is best to purchase from reliable seedsmen. There are several varieties on the market, but so far White Italian has given the best results in this State. At the same time, growers are advised to experiment with new varieties from time to time, or introduce fresh strains of those kinds they have in constant cultivation, with the view of finding out what particular kind is most suitable to their conditions.

By-products.

The object of the cultivator should be produce brush of the best quality; consequently all other use of the plant must give way to this. In former years millet was allowed to develop a fair proportion of seed, but the diminished value of the brush was not compensated for by the value of the seed obtained. The finest green brush is usually obtained while the seed is in an immature condition, but in the production of good golden-coloured millet a fair proportion of the grain is more or less developed. This contains an amount of nutriment, and can be utilised for the feeding of stock, thus assisting in reducing the expenses of the crop. It is, however, generally more or less soft and doughy, and, if intended to be kept for any great length of time, should be thoroughly dried by spreading out in thin layers on tarpaulins. Growers who insist upon ripening their seed will secure brush of an inferior quality, which brings a low price upon the market, and if exported injures the trade.

Stalks and Leaves.

The plant cannot be recommended as a particularly useful one for feeding purposes. While young a certain amount of sugar exists in the sap, but this soon disappears, and by the time the brush is cut the stalks are more or less dry or pithy, and contain a large proportion of fibre matter which is unpalatable. For this reason very little use is made of them beyond turning stock in after the harvest to feed upon the leaves. The refuse should afterwards be cut up with a heavy disc harrow, or cornstalk cutter, and ploughed under for manure.

Piggery Management.

By L. A. DOWNEY, H.D.A., Instructor in Pig Raising.

TO make a success of pig raising, it is essential to commence with good pigs, ample foods of the correct kinds, and good accommodation for the stock, but these factors alone are not sufficient to reasonably insure the success of the venture; it is further essential that the farmer should have a thorough knowledge of the care and management of his pigs in order that he may make the best use of his resources.

Handling the Boar and Sows Prior to Mating.

Young pigs should be well grown before mating; breeding from animals too early in their growth will, in a few generations, ruin their size, which is the most important characteristic of any pig. If the farmer wants to have large and fast-growing pigs, he must breed them that way as well as feed them that way. All the feed in the world won't make a draught horse of a pony colt, and the same applies to pigs—they must have size (which means fast and lean growth) bred into them. Usually pigs are well enough grown for mating at nine or ten months of age, or over 250 lb. live weight, and boars and sows must be kept apart until they reach that stage. If this is not done they will mate, perhaps, at five months of age.

Young boars and sows intended for breeding should be grazed in good paddocks and given ample flesh-forming foods, such as lucerne and separated milk, with a limited supply of grain, the object being to keep them in good thrifty growing condition and yet not too fat: if the breeding stock become too fat there is a risk of them not breeding satisfactorily. This is also the case where breeding pigs are kept in low condition. There is a medium condition which should be aimed at.

Mating.

For best results the boar should be kept in a separate enclosure to the sows, and when a sow is hogging (which is usually well indicated to the intelligent pig-raiser) she should be placed with the boar, and allowed one service, then removed, and if it is practicable, she should be put in a yard on her own so that she will not be knocked about by other pigs riding her. Then it may be advisable to allow the sow to return to the boar for a second service on the following day. If the sow does not hold to the service she will be in season again in twenty-one days. The period of heat (œstral period) usually lasts for two days, although it varies in different sows from one to three days.

After the service has taken place it should be recorded in a "breeding" book, together with the date, then three weeks later the sow should be watched to see if she returns to service. From this book entry the expected date of farrowing can be determined by reference to a gestation chart. The gestation period is approximately 112 days (easily remembered as approximately three months, three weeks, and three days). This period varies considerably and is usually less than 112 days with young sows and more than 112 days with old sows.

Care of In-pig Sows.

At service time, the sow is usually in medium condition. She should then be fed so as to have her gradually improving up to farrowing time, when she should be in her best form but not excessively fat. This condition can be obtained by good management and feeding without any forcing with fattening foods. Firstly, the sow should be given the run of a good grazing paddock where she will be able to forage for some of her food, and thus she may be kept at a low cost. The in-pig sow should be kept away from disturbances, such as dogs, horses, cattle, and other sows which are hogging, as rough treatment or excitement may cause a sow to abort. The feeding-trough should be arranged so that in-pig sows do not have to scramble and fight for their food. A lucerne paddock is an ideal place for dry sows; they also do well if allowed to roam over old cultivation paddocks or on root crops, such as artichokes and sweet potatoes, where they can harvest their food, thus getting the necessary exercise. Separated milk is a very valuable food for in-pig sows; they should also be given free access to clean drinking water. If maize is fed to in-pig sows, it should be given sparingly. The sows should have a warm, dry, shelter shed into which they can go for protection from the extremes of the weather. Shade trees are also very useful in the paddocks.

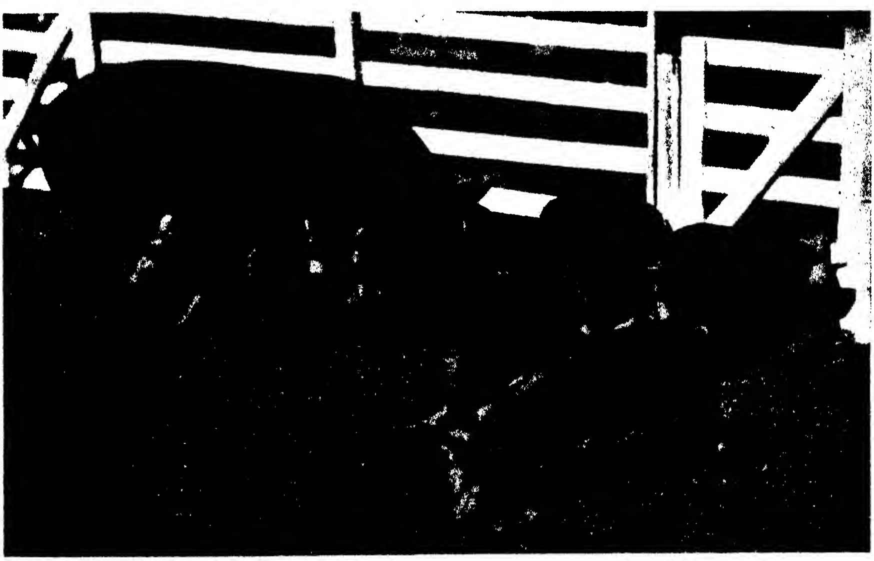

PLATE 114.

The number and weight of the pigs reared in each litter reflect the efficiency of the business.

Towards the end of the gestation period it is very advisable to clean all the lice off the sow so that the young pigs will not be infested soon after they are born. To destroy the lice, the sow should receive three applications, one week apart, of either a weak coal-tar disinfectant solution, or some cheap grade of oil. These should be either sprayed or rubbed on to every part of the pig's skin.

Farrowing Time.

About a fortnight before the sow is expected to farrow she should be taken from the herd and placed in a run on her own where she can go into a clean and comfortable shed. Some short, dry grass or straw should be put into the shed for bedding, and this should be changed when necessary to keep the bed clean and dry. Exercise is essential at this period to prevent the sow from becoming constipated, which would cause trouble in parturition and may be followed by fever. Just prior to farrowing the sow should be fed very lightly, and the food should be of a laxative nature—green foods and a little molasses are very useful.

The sow should be kept as quiet as possible at farrowing time, although it is advisable to be with her if possible, not to interfere, but to be ready to give assistance if it is required. In attending a farrowing sow it is necessary to use a lot of common sense in conjunction with a knowledge of anatomy and physiology.

The Suckling Period.

It is important that the sow should not be fed for about twenty-four hours after farrowing, unless it is to give her a small drink. The first feed should be a light one, half-a-cupful of castor oil added to the first feed will help to put the sow in good form. For the first three weeks after farrowing the sow should be fed lightly, as overfeeding at this stage is a common cause of scours in the suckers. From the third week onwards the feed can be given freely, as at this stage the young pigs make most use of their food. When three weeks old the suckers should be provided with some food in a low trough; this in addition to the sow's milk, helps the young ones along and they are thus well grown at weaning time. A self-feeder may be used to advantage at this period.

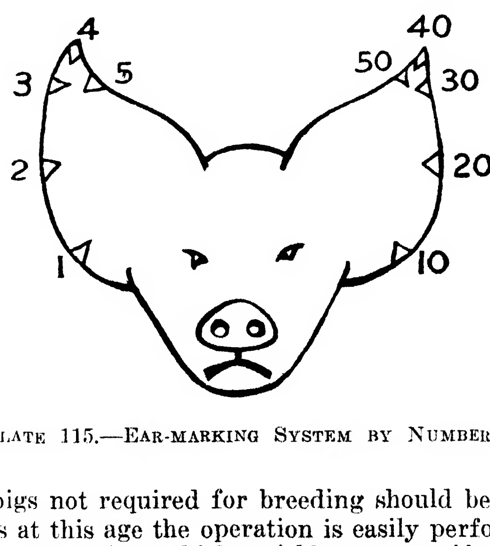

PLATE 115.—EAR-MARKING SYSTEM BY NUMBERS.

The male pigs not required for breeding should be castrated when six weeks old, as at this age the operation is easily performed and it has little ill effect on the pigs, which quickly recover if the operation is done properly and they are treated with some disinfectant, then put into a clean grass run. Ear tattooing and ear-marking can be done at the same time as castration.

GESTATION CHART FOR BREEDING SOWS.

Jan.	Date of Farrowing.	Feb.	Date of Farrowing.	March.	Date of Farrowing.	April.	Date of Farrowing.	May.	Date of Farrowing.	June.	Date of Farrowing.	July	Date of Farrowing.	Aug.	Date of Farrowing.	Sept.	Date of Farrowing.	Oct.	Date of Farrowing.	Nov.	Date of Farrowing.	Dec.	Date of Farrowing.
1	22 April	1	23 May	1	20 June	1	21 July	1	20 Aug.	1	20 Sept	1	20 Oct.	1	20 Nov.	1	21 Dec.	1	20 Jan.	1	20 Feb.	1	22 Mar.
2	23 ,,	2	24 ,,	2	21 ,,	2	22 ,,	2	21 ,,	2	21 ,,	2	21 ,,	2	21 ,,	2	22 ,,	2	21 ,,	2	21 ,,	2	23 ,,
3	24 ,,	3	25 ,,	3	22 ,,	3	23 ,,	3	22 ,,	3	22 ,,	3	22 ,,	3	22 ,,	3	23 ,,	3	22 ,,	3	22 ,,	3	24 ,,
4	25 ,,	4	26 ,,	4	23 ,,	4	24 ,,	4	23 ,,	4	23 ,,	4	23 ,,	4	23 ,,	4	24 ,,	4	23 ,,	4	23 ,,	4	25 ,,
5	26 ,,	5	27 ,,	5	24 ,,	5	25 ,,	5	24 ,,	5	24 ,,	5	24 ,,	5	24 ,,	5	25 ,,	5	24 ,,	5	24 ,,	5	26 ,,
6	27 ,,	6	28 ,,	6	25 ,,	6	26 ,,	6	25 ,,	6	25 ,,	6	25 ,,	6	25 ,,	6	26 ,,	6	25 ,,	6	25 ,,	6	27 ,,
7	28 ,,	7	29 ,,	7	26 ,,	7	27 ,,	7	26 ,,	7	26 ,,	7	26 ,,	7	26 ,,	7	27 ,,	7	26 ,,	7	26 ,,	7	28 ,,
8	29 ,,	8	30 ,,	8	27 ,,	8	28 ,,	8	27 ,,	8	27 ,,	8	27 ,,	8	27 ,,	8	28 ,,	8	27 ,,	8	27 ,,	8	29 ,,
9	30 ,,	9	31 ,,	9	28 ,,	9	29 ,,	9	28 ,,	9	28 ,,	9	28 ,,	9	28 ,,	9	29 ,,	9	28 ,,	9	28 ,,	9	30 ,,
10	1 May	10	1 June	10	29 ,,	10	30 ,,	10	29 ,,	10	29 ,,	10	29 ,,	10	29 ,,	10	30 ,,	10	29 ,,	10	1 Mar.	10	31 ,,
11	2 ,,	11	2 ,,	11	30 ,,	11	31 ,,	11	30 ,,	11	30 ,,	11	30 ,,	11	30 ,,	11	31 ,,	11	30 ,,	11	2 ,,	11	1 Apr.
12	3 ,,	12	3 ,,	12	1 July	12	1 Aug.	12	31 ,,	12	1 Oct	12	31 ,,	12	1 Dec.	12	1 Jan.	12	31 ,,	12	3 ,,	12	2 ,,
13	4 ,,	13	4 ,,	13	2 ,,	13	2 ,,	13	1 Sept.	13	2 ,,	13	1 Nov	13	2 ,,	13	2 ,,	13	1 Feb.	13	4 ,,	13	3 ,,
14	5 ,,	14	5 ,,	14	3 ,,	14	3 ,,	14	2 ,,	14	3 ,,	14	2 ,,	14	3 ,,	14	3 ,,	14	2 ,,	14	5 ,,	14	4 ,,
15	6 ,,	15	6 ,,	15	4 ,,	15	4 ,,	15	3 ,,	15	4 ,,	15	3 ,,	15	4 ,,	15	4 ,,	15	3 ,,	15	6 ,,	15	5 ,,
16	7 ,,	16	7 ,,	16	5 ,,	16	5 ,,	16	4 ,,	16	5 ,,	16	4 ,,	16	5 ,,	16	5 ,,	16	4 ,,	16	7 ,,	16	6 ,,
17	8 ,,	17	8 ,,	17	6 ,,	17	6 ,,	17	5 ,,	17	6 ,,	17	5 ,,	17	6 ,,	17	6 ,,	17	5 ,,	17	8 ,,	17	7 ,,
18	9 ,,	18	9 ,,	18	7 ,,	18	7 ,,	18	6 ,,	18	7 ,,	18	6 ,,	18	7 ,,	18	7 ,,	18	6 ,,	18	9 ,,	18	8 ,,
19	10 ,,	19	10 ,,	19	8 ,,	19	8 ,,	19	7 ,,	19	8 ,,	19	7 ,,	19	8 ,,	19	8 ,,	19	7 ,,	19	10 ,,	19	9 ,,
20	11 ,,	20	11 ,,	20	9 ,,	20	9 ,,	20	8 ,,	20	9 ,,	20	8 ,,	20	9 ,,	20	9 ,,	20	8 ,,	20	11 ,,	20	10 ,,
21	12 ,,	21	12 ,,	21	10 ,,	21	10 ,,	21	9 ,,	21	10 ,,	21	9 ,,	21	10 ,,	21	10 ,,	21	9 ,,	21	12 ,,	21	11 ,,
22	13 ,,	22	13 ,,	22	11 ,,	22	11 ,,	22	10 ,,	22	11 ,,	22	10 ,,	22	11 ,,	22	11 ,,	22	10 ,,	22	13 ,,	22	12 ,,
23	14 ,,	23	14 ,,	23	12 ,,	23	12 ,,	23	11 ,,	23	12 ,,	23	11 ,,	23	12 ,,	23	12 ,,	23	11 ,,	23	14 ,,	23	13 ,,
24	15 ,,	24	15 ,,	24	13 ,,	24	13 ,,	24	12 ,,	24	13 ,,	24	12 ,,	24	13 ,,	24	13 ,,	24	12 ,,	24	15 ,,	24	14 ,,
25	16 ,,	25	16 ,,	25	14 ,,	25	14 ,,	25	13 ,,	25	14 ,,	25	13 ,,	25	14 ,,	25	14 ,,	25	13 ,,	25	16 ,,	25	15 ,,
26	17 ,,	26	17 ,,	26	15 ,,	26	15 ,,	26	14 ,,	26	15 ,,	26	14 ,,	26	15 ,,	26	15 ,,	26	14 ,,	26	17 ,,	26	16 ,,
27	18 ,,	27	18 ,,	27	16 ,,	27	16 ,,	27	15 ,,	27	16 ,,	27	15 ,,	27	16 ,,	27	16 ,,	27	15 ,,	27	18 ,,	27	17 ,,
28	19 ,,	28	19 ,,	28	17 ,,	28	17 ,,	28	16 ,,	28	17 ,,	28	16 ,,	28	17 ,,	28	17 ,,	28	16 ,,	28	19 ,,	28	18 ,,
29	20 ,,	—	—	29	18 ,,	29	18 ,,	29	17 ,,	29	18 ,,	29	17 ,,	29	18 ,,	29	18 ,,	29	17 ,,	29	20 ,,	29	19 ,,
30	21 ,,	—	—	30	19 ,,	30	19 ,,	30	18 ,,	30	19 ,,	30	18 ,,	30	19 ,,	30	19 ,,	30	18 ,,	30	21 ,,	30	20 ,,
31	22 ,,	—	—	31	20 ,,	—	—	31	19 ,,	—	—	31	19 ,,	31	20 ,,	—	—	31	19 ,,	—	—	31	21 ,,

NOTE.—Heavy figures in above table indicate date of service.

This chart presents in an instructive form figures relating to the gestation period of brood sows. For example, a sow mated to the boar on 1st January is due to farrow on 22nd April: a sow mated on 1st July is due on 20th October. The normal period of gestation, *i.e.*, the period from the time of conception to the birth of the young pigs, is 112 days.

SOW'S BREEDING RECORD.

Breed Name Registered Number Date of Birth Earmark

Date of Service	Date of Farrowing	Sire of Litter	Number Born		Number Weaned		Tattoo or Farmark Given and Date Weaned	Died after Weaning		Sold or Killed for Meat		Stud Sales		Gross Returns	Remarks
			Male	Female	Male	Female		Male	Female	Male	Female	Male	Female		

COPY OF PAGE FROM A RECORD BOOK.

Weaning.

The pigs should be weaned from the sow when they are eight to nine weeks old. After being separated for a day, the sow should be put with the litter for an hour or so for the pigs to empty her udders. This should be repeated on the following day, by which time most sows will be dry, although, in some cases, it is necessary to put the sow back to the suckers for several days before she dries off. At this time the sow's feed should be very light, so that she will not make much milk. The sow will usually come on hogging when the litter is about nine weeks old, and if she is not too low in condition, she can be mated to the boar then, but in cases where the sow's condition is very low, it is preferable to withhold the service for at least three weeks.

Record of Performance.

Just as poultry breeders record egg-laying as a measure of production of their birds, and dairy farmers test and record the production of their cows to ascertain which are the best producers, so must pig-raisers record the production of their breeding stock so that they may have a record of performance on which to select or cull their breeding stock. The system of selection by appearance alone is not sufficient. Pig recording is practised by individual breeders and in some countries by organisations and, although most systems of recording vary a little, the common factor throughout appears to be the weighing of litters of pigs at eight weeks old, the number of pigs, and individual and total weights being taken as indications of the productivity of the sow and boar, and of the efficiency of the feeding and management of the stock.

Work done in pig recording shows that a standard which breeders should aim at is an average of eight pigs reared per litter, and an average weight of 40 lb. per pig at eight weeks old.

The Growing Period.

It should be the object of the pig-raiser after weaning his pigs to have them growing rapidly until they are ready to market; there should be no "store" period, but the pigs should be fed in such a way as to have them "finished," but not excessively fat, when they reach their weight range as porkers, light baconers, or heavy baconers, as the case may be.

WHEN GOD PLANTED A GARDEN.

In the beginning . . . the Lord God planted a garden eastward in Eden; and out of the ground made the Lord God to grow every tree that is pleasant to the sight and good for food; and a river went out of Eden to water the garden; and the Lord God took the man and put him into the garden of Eden to dress it and keep it.—Genesis.

Bloat in Cattle.

THE present season with the conditions favourable to the production of an abundance of succulent green foods has given rise to a number of cases of *hoven* or *bloat* in cattle. Stockowners know that bloat is liable to affect animals that are suddenly turned into lucerne, clover, and field crops, especially when the crop is immature and wet with dew or rain. They know also that hungry cattle are more susceptible to bloat.

The condition is caused by the formation of large quantities of gas in the *rumen* or *paunch,* which results in an abnormal distension or swelling of the left flank. It is known that the food distending the paunch or rumen becomes yeasty so that it froths and foams and throws off large quantities of gas. The natural or normal way of expulsion of gas by the animal is by belching, but when the gas forms quickly and in large quantities and the stomach becomes unduly distended normal belching appears to be checked and does not occur. It has been said that the distension may cause a partial paralysis of the muscle fibres of the walls of the stomach, which prevents the normal churning motion of the stomach (Peristalsis), so essential in the preparation of the roughage for the full digestion in the fourth department of the stomach, the abomasun.

Peristalsis aids in the belching or expulsion of gases from the stomach, and when the action is checked bloating would occur. It has been suggested by nutritional chemists that the sugar content of lucerne and clover blossoms is a factor in increasing fermentation and formation of gases in the paunch, but of course this theory would not hold where the animals have eaten immature lucerne or clover which have been known to cause bloating. It may be possible that the *cyanoglucoside content* is a contributing factor apart from the flowers or blossoms.

Treatment of Bloat.

A number of remedies have been tried, and have proved more or less successful. The use of a gag to keep the mouth open, until the animal has belched the gas out by the mouth, is useful in mild attacks. Other remedies, including the internal administration of an ounce of bicarbonate of soda and an ounce of ginger, which may be repeated every two or three hours until the animal is relieved. A quart of treacle in a gallon of water has afforded relief in some cases. Two ounces of turpentine in milk has afforded relief, but in such cases it must be noted that the attack is not severe. In all cases of bloat the most effective treatment is the puncturing of the paunch.

The puncture is made in the left side of the paunch at a point equidistant from the last rib, the edge of the *loin bones,* and the angle of the *haunch.* The proper instrument to use is a trocar and canula, the canula being a tube or covering through which the trocar, a sharp-pointer instrument passes.

The instrument is thrust into the *rumen* and the trocar is then withdrawn, leaving the canula in place for the gas to escape through it. In cases of emergency when no instrument is available a knife may be

used, the gas escaping through the opening. But the use of a knife is not advocated as it may give rise to complications and cause the death of the animal if it is not carried out by a person who is experienced in it.

After the gas has escaped, the animal may be given a dose of linseed oil, 1½ pints, turpentine a tablespoonful, mixed thoroughly by shaking while being given to the animal.

QUEENSLAND SHOW DATES, 1934.

April.

Pittsworth, 4th and 5th
Warwick, 10th to 12th
Toowoomba, 16th to 19th
Rosewood Camp Draft, 7th
Goondidwindi, 27th and 28th
Oakey, 28th
Taroom Camp Draft, 30th

May.

Taroom, 1st and 2nd (Camp Draft, 5th)
Dalby, 3rd and 4th
Beaudesert, 2nd and 3rd
Nanango, 3rd and 4th
Blackall, 7th to 9th
Chinchilla, 8th and 9th
Charleville, 8th to 10th
Crow's Nest, 9th and 10th
Boonah, 9th and 10th
Monto, 9th and 10th
Kingaroy, 10th and 11th
Ipswich, 15th to 18th
Miles, 16th
Kilkivan, 16th and 17th
Mitchell, 16th and 17th
Mundubbera, 16th and 17th
Dirranbandi, 16th and 17th
Wondai, 17th and 18th
Roma, 22nd to 24th
Gympie, 23rd and 24th
Emerald, 23rd and 24th
Biggenden, 24th and 25th
Murgon, 24th to 26th
Toogoolawah, 25th and 26th
Kalbar, 26th
Goomeri, 29th and 30th

June.

Maryborough, 1st, 2nd, and 4th
Marburg, 1st and 2nd
Childers, 5th and 6th
Gin Gin, 5th and 6th

June—*continued.*

Bundaberg, 7th to 9th
Lowood, 8th and 9th
Bororen and Miriam Vale, 11th and 12th
Wowan, 14th and 15th
Rockhampton, 19th to 23rd
Mackay, 26th to 28th
Laidley, 27th and 28th
Proserpine, 29th and 30th
Townsville Rodeo, 30th

July.

Bowen, 4th and 5th
Gatton, 4th and 5th
Kilcoy, 5th and 6th
Ayr, 6th and 7th
Townsville, 10th to 12th
Woodford, 12th and 13th
Rosewood, 13th and 14th
Cleveland, 13th and 14th
Cairns, 17th to 19th
Charters Towers, 18th and 19th
Caboolture, 20th
Nambour, 18th and 19th
Atherton, 24th and 25th
Pine Rivers, 27th and 28th

August.

Royal National, 6th to 11th
Home Hill, 31st August and 1st September

September.

Enoggera, 1st
Imbil, 7th and 8th
Ingham, 7th and 8th
Innisfail, 14th and 15th
Beenleigh, 20th and 21st
Mareeba, 20th and 21st
Rocklea, 22nd
Malanda, 26th and 27th
Kenilworth, 29th

October.

Millaa Millaa, 5th and 6th
Tully, 12th and 13th

Seasonal Farm Crops.

By A. E. GIBSON, Director of Agriculture.*

AT this period of the year, the dairy farmer and those primary producers who derive at least a portion of their income from the keeping of stock, should be giving consideration to the planting or sowing of those crops which during our recognised season of lessened rainfall will still enable them to maintain supplies to the local butter or cheese factory or top-off stock which are destined for the meat market, and it is with the idea of presenting for their consideration suitable crops for such purpose that the present lecturette has been prepared.

Land Preparation.

As with all crops, careful initial preparation is necessary and, although during periods of frequent rainfall crops of a satisfactory type can be successfully raised, it is to the careful farmer that success is ensured during those periods when the rainfall is below normal.

Having carefully prepared the land, consideration is naturally given to the type of crop which it is desired to produce and its suitability to the class of soil, and last but not least the temperate conditions required in connection with its production.

Winter Cereals and Legumes.

The dairyman with a view to continuity of green fodder supplies will naturally incline towards winter cereals; those who include the raising of pigs with their dairying activities will also give consideration to root and other crops that will maintain their growing pigs during the winter months, when skim milk supplies are usually somewhat restricted.

Barley, and preferably an awnless type, although not the earliest of the winter cereals, is one to which most attention is given. It is suited to many types of soil, but will not thrive in sour or acid soils. Severe frosts will check its growth, whilst excessive wet shows its effects in the yellowing of the leaves. It provides succulent grazing for calves, lambs, and pigs, and will stand fairly hard grazing. Where it is intended to plant for fodder purposes with a view of feeding to stock, rather than grazing off, the addition of field peas is recommended, and if sown in conjunction with skinless barley, excellent results are attained.

Field peas of the Dun, Grey, or Partridge varieties are usually available from Brisbane or Toowoomba seed merchants, the former variety perhaps being the most popular.

When used in conjunction with barley, best results are obtained by sowing at the rate of $\frac{1}{4}$ bushel to $\frac{1}{2}$ bushel of peas to $\frac{3}{4}$ bushel to 1 bushel of barley, and if sown under favourable conditions of soil and moisture such will give a sufficient density of growth.

Sow now or as early as possible in the present month, and if you are possessed of a grain drill drill in at a depth of not less than 2 inches, stopping one-third of the grain runs, to aid in distributing the small quantity of seed, otherwise broadcast over and in the direction of the furrows, and follow up with one stroke of the harrows in the same direction.

* In a broadcast address from Radio Station 4QG.

The barley may then be drilled or broadcasted and followed by two harrowings, the last at right angles to the direction of the previous harrowing.

For a rotational crop, follow with a crop of oats and peas, sown in a similar manner to that recommended for barley and peas. Of all the varieties of oats grown for hay or fodder purposes, perhaps the most popular is Algerian, but of later years selections have been made which have giyen a somewhat wider range of better types, although many have been the result of crossing with the Algerian variety.

Perhaps for Queensland purposes Sunrise is to be preferred to Algerian and is much less liable to rust. It is an early-maturing type carrying a medium coarse straw and consequently for hay purposes should be sown slightly thicker than is usual with Algerians. It stands feeding off well.

Mulga is also a satisfactory variety for this State and is in fact a selection from Sunrise, but somewhat earlier in maturing than that variety and does well in warm districts. It is a variety of oat that can be sown for successional grazing off and lends itself admirably for fodder purposes when sown in conjunction with field peas. Sow at the rate of 1¼ bushels per acre, using the same quantity of peas as in the case of barley.

Fodder Crops for Pigs.

Where the dairyman, as he should, combines pig-raising with his dairying activities, the advantage of such crops as rape, swede turnips and field carrots, mangolds and sugar beet, should claim his attention, and under normal conditions in the cooler portions of this State give very satisfactory returns.

Rape may be sown now in drills 14 inches apart using 3 to 4 lb. of seed per acre. Dwarf Essex is the best variety for Queensland purposes, but should be cleaned up before the warm weather sets in as it is usually affected by cabbage aphis. Rape, when ploughed in, has considerable value as a soil renovator. Care requires to be taken in feeding off rape, as it is liable to cause bloat or hoven.

Swede turnips can be sown either broadcast or in drills, but the latter is preferable unless in those areas where winter rainfall is more favourable. Two to 3 lb. in drills 2 feet to 2 feet 6 inches apart will be found to be ample, but double that quantity if broadcasted. The latter system is preferable, perhaps, where it is intended to graze off the crop and climatic conditions lend themselves to such practices. Varieties recommended are Purple Top and Monarch.

Field carrots have given satisfactory results in quite a number of localities in Southern Queensland and are excellent where root crops can be utilised. Sow at the rate of 4 lb. per acre in drills spaced 2 feet 6 inches apart. White Belgian is a variety recommended.

Although in the cooler districts mangolds and sugar beet should now be above ground, in the warmer areas present month sowings will give quite satisfactory yields during the late winter and early spring months.

Mangolds and beet require to be sown in clean, well-prepared land, in drills 2 feet 6 inches apart, and when well above the surface should be thinned out with the hoe to give the roots a chance to develop. Weeds at the same time should be attended to.

Mangolds and beet are not remarkable for their germinating qualities, consequently sowings are comparatively heavy. Sow mangold seed at the rate of 5 lb. per acre. Sugar beet, however, require from 7 to 8 lb. per acre.

Long Yellow, Long Red, and Golden Tankard are amongst the best of the varieties of mangolds, whilst Vilmorin's Improved and Wanzelben are representative varieties of sugar beet.

Lucerne.

Perhaps the most valuable fodder crop to which serious consideration should be given for sowing during the months of April and May is that king of all fodders—lucerne—and as this crop will give satisfactory returns over a period of years every care should be given to the early and thorough preparation of the soil. Lucerne prefers a deep, rich, calcareous soil, and gives excellent results on the basaltic soils met with on the Darling Downs, and the Lockyer and Fassifern districts, but very good results are obtainable along alluvial creek flats, being useful where nut grass is in evidence, and for such reason it is not desirable that general cultivation be continued. A sandy loam, however, does not give satisfactory growths of lucerne, although where such is present it can be utilised when well fertilized, preferably with heavy dressings of farmyard manure, for green feed for poultry. Above all, badly drained soils are fatal to the growth of lucerne.

On new land a preparatory winter or spring crop is advisable, and when this has been harvested the stubbles should be ploughed under and the soil allowed to mellow. Any volunteer growths that appear should be subsequently ploughed under in the second ploughing, carried out at right angles to the first ploughing. The soil may be left in its rough condition and will thus absorb all rainfall that is experienced whilst lying fallow, the result being a breaking down of clods, and if given a stroke of the harrows a moderate tilth will result. At this stage weed growth should be very decidedly checked, and after each shower the ground harrowed and left loose on the surface.

If this is not given effect to, the surface becomes compacted and the greater proportion of moisture, instead of being absorbed by the soil, becomes diverted over the surface to lower levels.

At least three ploughings should be given prior to sowing, each being carried out at a greater depth to the one preceding. Surface tillage should be given effect to with the object of reducing the soil surface to that fineness of texture necessary in the preparation of an onion bed.

Of the many varieties of lucerne which have been experimented with in this State none appear to be superior or even equal to that variety which we term Broad Leaf Hunter River and, although many growers insist on none but that which is actually produced in the Hunter River district of New South Wales, I have to remind them that New South Wales is a good customer of Queensland for lucerne seed, and at the same time much is reimported. Under these conditions, provided that the seed is cleaned and is free from dodder, it would appear unnecessary to incur the cost of two railway freights when obtaining the same article.

When purchasing lucerne seed, from whatever source, it is wiser to obtain a sample from the vendor, and if in doubt of its germinating qualities such can be ascertained by submitting the sample to the Pure

Seeds Branch of the Department of Agriculture and Stock, and if such is required, a certificate not only of its percentage of germination, but of its purity can be obtained. Sow at the rate of 10 lb. per acre and, whilst on the subject of quantity of seed per acre, it should be noted that where a high percentage of germination is in evidence, the quantity of seed per acre can be lessened even down to 7 or 8 lb. without materially lessening the density of the subsequent "stand." A frequent cause of bad germination in the field is sowing at an excessive depth, half an inch being ample provided that conditions for sowing are as they should be.

I once inspected in the Boonah district an area sown just prior to rain that only received 7 lb. per acre, when rain fell and prevented the owner from carrying out his original intention of sowing a further 7 lb. at right angles to the direction of the first sowing. Before he could complete the operation, the young plants were in evidence. The stand of lucerne so obtained was dense enough for practical purposes and I understand gave satisfactory cuttings for several years.

WHEATGROWING ON THE DAWSON.

Speaking on the wheatgrowing possibilities on the Dawson River country on his return from a recent visit to that region, Mr. T. L. Williams, M.L.A. (Port Curtis), said:—

One thing that struck me somewhat forcibly during this visit was the fact that many of the settlers in the lower end of the Dawson Valley and the western portions of the Callide Valley lands in particular could very profitably engage in wheatgrowing on the larger outside areas. Several settlers in fact, have carried out "trial" experiments in this direction, with considerable and heartening success.

Among the number are Messrs. C. and F. Letchford, two comparatively new settlers a few miles out from the Theodore township in the dry, or non-irrigable section, who last year planted approximately 250 acres with wheat, from which the return was in the vicinity of 1,200 bags. The land received no special treatment or preparation, and was not even fallowed, being prepared late and planted to suit weather conditions pervailing at the time.

When dealing with this matter some years ago, on the occasion of a previous visit, I remarked at some length on the possibility of wheatgrowing in the Dawson and Callide Valley Areas, and said at the time that there was an undoubted future for wheatgrowing in the Theodore Settlement Area (more particularly in the adjacent holdings, which ultimately may form a part of the area to come under future direct settlement). There are, in fact, many thousands of acres of land suitable in every way for its cultivation and production in portions of the Woolthorpe, Colombo, Walloon, and Kianga holdings, as well as in the vicinity of Moura, adjacent to the railway line to Theodore. Settlers who happen to have come from wheatgrowing areas in the South, as well as in Queensland, readily agree on this point, whilst not a few visitors to the settlement in recent years express a somewhat similar viewpoint.

Cotton and small-crop growing, together with dairying, will no doubt be the main objectives of the majority of the settlers for the first few years of the settlement's existence, but sooner or later large areas will be eagerly sought after and snapped up for wheatgrowing purposes, which, without a doubt, will result in the Theodore Settlement Area becoming one of the most successful in the history of irrigation projects in the Commonwealth.

I have no cause to change my viewpoint to-day in this connection, particularly after seeing what has been achieved by the Messrs. Letchford Brothers and a number of other wheatgrowing enthusiasts in both areas, and hearing further favourable expressions in this regard from other settlers.

Even sheep farming and the growing of fat lambs for market purposes could also become a profitable sideline in many instances, where conditions happened to be suitable and the required areas obtainable for the purpose. For both needs, however, a suitable crossbreed would be necessary if any degree of success were to be obtained, and in this respect I would not hesitate to recommend heavy-coated merino ewes and English Leicester rams. Dingoes would no doubt be a source of much annoyance and loss, of course, and the necessary precautions to combat the pest would have to be taken to ensure success.

Agricultural Notes.

By H. S. HUNTER, Agricultural Branch.

Seasonal Prospects.

AS a result of favourable seasonal conditions, the output of pastoral and agricultural products is being well maintained; prospects for the immediate future are encouraging from a production point of view, and the preparation of land for winter-growing crops can be carried out under suitable conditions. The chief disabilities confronting the primary producer continue to be those associated with marketing, in which field of activity problems have arisen which are claiming the attention of Governments in all countries.

Throughout the first four or five years of financial depression Queensland, as a whole, fortunately, has experienced reasonably good seasons. Although there have been short periods of dry weather, and more or less severe localised droughts in some districts, the State as a whole has not encountered, in the period referred to, any general drought such as has been experienced at recurring intervals in the past and, as a consequence, a high average of production has compensated in some degree for low market values.

The producer also has benefited from the operations of Marketing Boards operating under the State's marketing legislation. For products organised in this way, the producer invariably has secured a better price for his goods than his brother farmer in other States has been able to obtain. There are fifteen products, including sugar, which are subject to organised marketing in Queensland, the value of which is approximately £17,000,000 annually.

Wool.

Fortunately our principal revenue-producing industry, wool production, has risen from the rut. Prices have been well maintained at recent sales, ranging up to 23½d. for greasy and 41d. for scoured wool. An indication of the value to Australia of the improvement in wool prices is provided in the figures recently made available by the Commonwealth Department of Commerce, which show that the value of wool exported from Australia during the first seven months of the present financial year was £17,600,000 more than for the corresponding period of last year.

Wheat.

The wheat-growing industry is in a totally different position. Hitherto Australia, since the depression, has been enabled to clear all of her stocks, although at low values, mainly due to sales in the Eastern market, whereas most of the other wheat-exporting countries have been accumulating vast carry-over stocks. However, the quantity of wheat and flour shipped overseas from last season's crop, is equivalent to 26,000,000 bushels only, as compared with 52,000,000 bushels for a corresponding period in the preceding season. This falling off in exports has been attributed to large sales of wheat to China on long credit from the United States of America, and to heavy shipments of wheat to the East from the Argentine. Although Queensland is not a wheat-exporting State, local prices are influenced indirectly by export values.

Sugar.

The northern areas of the State experienced excessive rains during March; flood damage was occasioned in certain districts, while heavy winds resulted in lodging and damage to crops. As yet, the true extent of the loss is not ascertainable, and it is anticipated that the losses due to grubs will be much in excess of those of last year.

The areas south of Townsville have been favoured generally by conditions which make for continued growth, and the present indications are that the crop in these parts will exceed that of 1933.

Dairying.

Butter and cheese factories are maintaining a high output, but returns to producers are so low that hardship is caused in many cases. It is probable that within the course of a few weeks the new Australian stabilisation scheme will be put into operation. Agreements have been forwarded to the various factories for signing as a preliminary to the inauguration of the scheme, which is similar to the existing Queensland stabilisation scheme in that all factories will be required to bear their fair share of the less remunerative export market.

The advantage of the Australian-wide scheme is that, when it is in operation local prices for butter will not be influenced by fluctuations in butter prices on the London market.

The previous record for butter production in Queensland already has been eclipsed, and with a continuance of favourable conditions it is expected that the total production for the season will be in the vicinity of 2,000,000 boxes.

Maize.

Harvesting of the main maize crop now has commenced, the markets have been well supplied with new season's grain and prices have shown a further decline. For the first three weeks of March the maximum daily quotations averaged 2s. 4½d. per bushel. Excellent crops are reported in the Kingaroy district. In fact, all maize-growing areas of Southern Queensland will have unusually heavy crops, including the Darling Downs. It has been estimated that the Atherton Tableland crop will yield about 8,000 tons of grain.

Cotton.

Queensland's record crop of cotton is now being harvested, and the ginneries are working to full capacity. It has been found necessary to reopen the Gladstone ginnery—after it had been closed for a period of nine years—in order to deal with part of the crop. Arrangements have been made whereby it will be possible for about half of the crop to be absorbed by Australian spinners. Considerable interest is being evinced in the visit of the Minister for Customs who, at the time of writing, is visiting the cotton-growing areas.

Peanuts.

It is probable that the peanut yield also will constitute a record. About 9,000 acres have been planted to the crop, and seasonal conditions have favoured its development. The peanut is a crop of potential value as a rotational crop for tobacco lands and is now being experimented with for this purpose. About 200 acres have been planted with peanuts this season in the Mareeba tobacco district.

Since the removal of the embargo on foreign peanuts, the Tariff Board has conducted an inquiry into the industry, following on a request for an increase in Customs duty.

Tobacco.

Blue mould disease has been exceptionally prevalent in all tobacco-growing areas this season, and as a result growers have experienced great difficulty in raising seedlings in time for transplanting. In many instances transplanting was still progressing during the month, which is somewhat late for good results.

A considerable reduction in the area under tobacco is anticipated this season, owing to both disease and to the fact that a number of growers went out of the industry or planted smaller areas for various other reasons.

Although it is yet too early to make a reliable forecast of the probable acreage, it would appear from information received that the total area may not exceed 3,000 acres, as compared with approximately 8,000 acres last season.

NATURAL GRASSES AND THEIR REGENERATION.

Problems confronting the people who depend on Mitchell and Flinders grasses for the sustenance of their flocks and herds are to be investigated by the Department of Agriculture and Stock. The assistant botanist of the department (Mr. W. D. Francis) is about to leave on a special mission of inquiry in the Charleville district.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock) announced recently that his department had given much attention to the regeneration of Mitchell grasses. Some inquiry also had been made in respect of Flinders grasses. The researches of Dr. E. Hirschfeld had been of great value, but reports were continually reaching the department to indicate conclusively the need for a wider range of inquiry in relation to both types of grasses.

Mitchell grass, added the Minister, was the standard natural grass of the best of the State's sheep areas, but complaints had been received recently that the Mitchell grass land was not regenerating from the continued drought in the way that it had in past years. Consequently, it had been decided to embark on a vigorous inquiry into this and allied problems. Mr. W. D. Francis would leave within a few days for Charleville to obtain information from station owners and others as to the regrowth made this season, following several years of drought. Local stock inspectors would co-operate with Mr. Francis.

In addition, a questionnaire had been distributed to all officers of the department and station managers within the Flinders and Mitchell grass areas. This sought information on the responsiveness of the grasses during the present season, and also asked for specimens, and any notes or information on different kinds of Flinders or Mitchell grass; also for details of any other grasses of outstanding value, particularly in relation to palatability and drought resistance; and concerning any herbs of outstanding merit associated with the grasses.

Mr. Bulcock said it was hoped by this means to collate valuable information, upon which would depend the nature of a survey to be embarked upon at a later date. He appealed to pastoralists to supply the required information. As evidence of the interest now being taken in the preservation of natural pastures, added Mr. Bulcock, one of the big Australian pastoral institutions was circularising the Australian Universities to obtain the services of a graduate to study inland pastures.

PLATE 116

Thrashing Oats on Mr. C. F. Adermann's Farm, Kingaroy

Photo by courtesy of the "Courier Mail."]

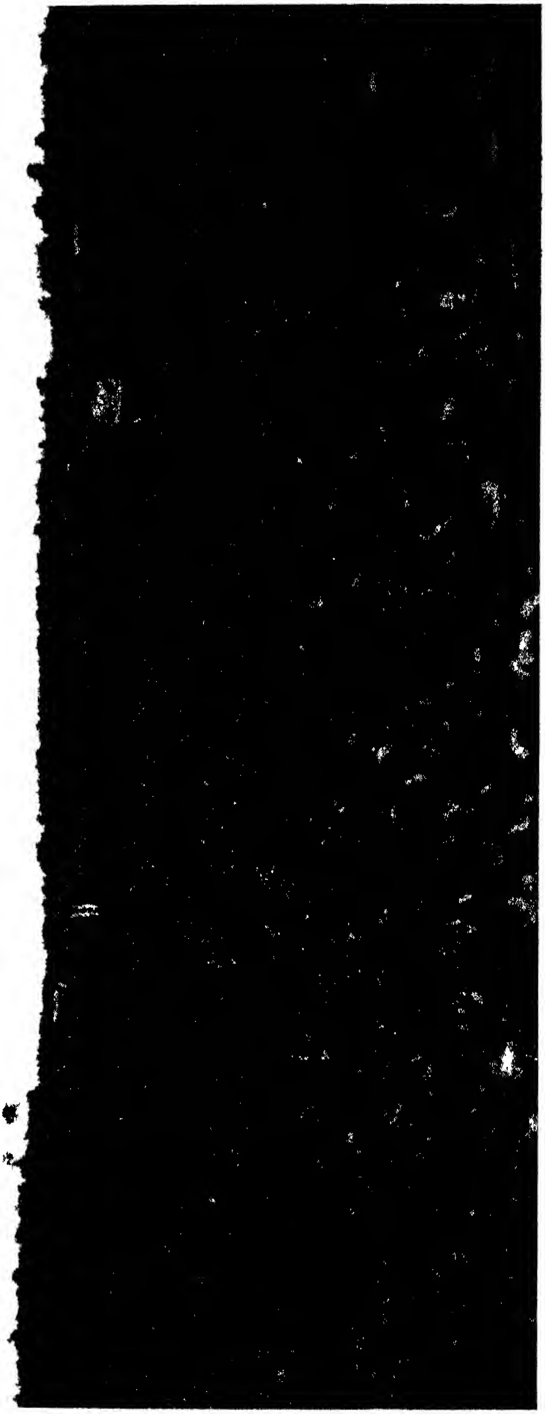

Plate 117.

A field of peanuts on Mr. L. A. Young's farm, Wooroolin.

[*By courtesy of the "Courier Mail."*]

Plywood and Veneer Industry.

FORMATION OF MARKETING BOARD.

THE Minister for Agriculture (Hon. F. W. Bulcock) announced recently that the Government had decided on the formation of a marketing board to control the Queensland plywood and veneer industry. This decision, said Mr. Bulcock, followed an application made by the Plywood Manufacturers' Association of this State, which had been supported by deputations and representations from all South Queensland factories, with one exception.

The plywood industry is an important one for Queensland as it is in this State that most of the Australian production of plywood and veneers from native timbers is manufactured.

The capital invested in the industry in Queensland is in the neighbourhood of £350,000. Last year it used 8,000,000 super. feet of hoop pine logs of a value of £90,000 delivered at factories, and gave employment to over 400 hands, with a total pay-roll of £1,600 per week when all mills are working, in addition to the work afforded in cutting, hauling, loading, railage, cartage, and shipping. The production of plywood by South Queensland factories during last year was approximately 32,000,000 square feet of a value of over £200,000.

Possibility of Increased Employment.

Whilst these figures speak for themselves, the Minister said that even on the present capital invested a considerably increased production is possible. Many plants are capable of a much greater annual output, if markets are available, and it is estimated that the existing factories could increase their production to 50,000,000 square feet per annum. Were such an objective realised the increased employment afforded would be obvious.

The industry has represented to the Government that what principally hampers the attainment of this objective is the fact that, through fierce competition among themselves, it has not been possible to exploit new markets and new uses to the fullest extent. Failing to secure absolute unanimity the manufacturers approached the Government for the formation of a pool under the Primary Producers' Organisation and Marketing Acts.

Other Advantages.

The Government has made a careful inquiry into the application and has found that organisation of the industry could, in addition to affording the opportunity of increased employment, have other advantages in that orderly marketing of the product for both Australian and overseas markets could be assured; the undue competition which has been detrimental to the industry and the State could be eliminated; the prices could be fixed in such a way as to protect the interests of both consumer and manufacturer and of the Government as the owner of the principal supplies of raw material, and bring about stability and continuous employment in the industry; the use of new woods and methods could be investigated thus more firmly establishing the life of the industry; standards and gradings of veneers and plywood

could be fixed with a view to improvement; and last, but not least, considerable work could be done in securing new markets for Queensland plywood.

"Having regard to all these facts," said Mr. Bulcock, "it appeared to the Government that it is imperative that some steps should be taken to lift the industry from its present disorganised condition, which is not in the best interests of the State generally, and after due consideration the formation of a Plywood and Veneers Marketing Board has been approved."

Public Interests Protected.

To protect the interests of the public, it is proposed to include on the board representatives of the Department of Agriculture and of the Forestry Sub-department. The proposed board, when constituted, will apply to South Queensland only; its functions not extending beyond the 23rd parallel.

"It is worthy of note," concluded the Minister, "that this is the first time in Australia that a marketing board has been appointed to control plywood and veneers, and is significant of the progressiveness of the policy of this Government in assisting in the orderly and stabilised manufacture and marketing of Queensland's raw materials—a policy in keeping with modern trend in administration the world over."

WHEAT AS STOCK FOOD.

The relatively large quantity of the current season's crop which is weather damaged, coupled with the low price ruling for even the best wheat, opens up a question whether more grain cannot be used as stock feed.

An average sample of wheat possesses the same protein content as oats, and rather more than maize. It is richer in carbohydrates than either oats or maize, but is relatively deficient in fats. This deficiency of oil or fat renders the grain less palatable to stock and less readily mixed with the saliva, whereby the digestibility of the grain is to some extent adversely affected. In a non-ruminating animal such as a horse, where the stomach is simple and of relatively small capacity, the proper mastication and mixing of food with saliva before swallowing is of importance if the digestion is to be saved. Ruminants, on the other hand, are in a better position to deal satisfactorily with the grain on account of the preparation which it undergoes in the process of chewing the cud before entering the fourth or true stomach.

Wheat may, nevertheless, be fed to horses with advantage and safety if discretion is exercised in its use, and it is first ground or rolled. It should be fed in moderate quantities, up to 7 or 8 lb. per day, and mixed with some bulky material such as bran or chaff. When it is desired to change horses over from oats to wheat, the change should be made gradually in order to allow the animal's digestive organs to become accustomed to the new diet.

Experiments conducted in various countries show that wheat can be fed to dairy cows with profit when mixed with other foods. A good meal mixture can be prepared as follows:—4 parts ground wheat, 1 part bran, 1 part linseed meal.

As portion of the ration for fattening cattle, wheat has given better results than oats.

Sheep will do well on wheat, which is better fed whole. In America it is considered slightly superior to maize, but experience in Australia shows that maize gives a somewhat better result. That, however, may be accounted for by the fact that grain is usually fed to sheep from the ground, and not from troughing. Wheat being so much smaller than maize, a certain amount of earth is picked up with it when feeding, to the detriment of the diet.

At least one Riverina farmer has proved it good business to feed wheat to pigs rather than accept anything below 3s. a bushel for the grain. His practice is to crush the wheat and feed it to the pigs through a self-regulating hopper erected in the yard. The pigs have access to plenty of water and fatten rapidly.—"The Pastoral Review."

The Conquest of Climate.

By R. W. CILENTO, M.D., B.S. (Adelaide), D.T.M. and H. (England), Senior Medical Officer, Commonwealth Department of Health, Canberra, F.T.

Subjoined are extracts from the Anne Mackenzie Oration delivered by Dr. Cilento at the Institute of Anatomy, Canberra, on 1st *March,* 1933. *In view of the national importance of extending settlement within our tropical territory, Dr. Cilento's oration, a valuable contribution to current thought on the subject, is of great interest to not only Queensland residents north of Capricorn, but also to everyone concerned with the future of our race and the preservation of the White Australia ideal.*—Ed.

MAN'S real ability to bear any extreme of temperature, altitude, rainfall *et cetera*, though often denied, is demonstrated by everyday experience. Lucien Lefèbvre, in the delightful work to which I am indebted for many of my examples, in developing the theme that man deliberately sets Nature at defiance, says:

> Can we talk of heat and cold—sheer heat and sheer cold, so to speak? Geographies generally agree to place the "pole of cold" at Verkhoyansk in Siberia; and it is a fact that of the three poles of cold which Mohn recognises in the Northern hemisphere, in his account of the meteorological results of Nansen's Polar Expedition (Eastern Siberia, Central Greenland, and the Polar Region properly so called), Siberia is the chief and the most accentuated. But Verkhoyansk, which is included in it, is an inhabited place, with a population of 356, according to the latest census, and the soil there is sown and cultivated every year: indeed, human families live and multiply there under conditions which are elsewhere considered prohibitive, for the January mean is -51.2 degrees. Inversely, Massowah on the Red Sea, in the middle of a stifling coastal plain, combines all the extreme conditions of heat which our meteorological treatises define, and is, notwithstanding, regularly inhabited (population 7,000) . . . Another series of meteorological phenomena has to be considered: the restrictive action of the barometric pressure is well known and evident. Men can work but little, and that with difficulty, under too low a pressure, but this did not prevent the making of a railway in Peru at a height of 13,000 ft.; nor the working of sulphur mines on Popacatepetl, at 17,800 ft. A road has been made at a height of 18,500 ft. in the Karakorum; and, lastly, 17 per cent. of all the towns in Bolivia are situated at a height of over 13,000 ft. In Southern Thibet mountain sickness is felt by travellers, at times very seriously, at an altitude of 12,000 to 15,000 ft.; but Shigatse is a town 12,740 ft. high, and Gyangtse stands at 13,000 ft., where a July temperature of 105 degrees has been recorded, whilst from September onward it freezes, and night temperatures of -16 degrees are frequent and even normal in winter.

Woeikof points out that half the human race (806 millions) lives between the 20th and the 40th degrees of north latitude, that is to say, in that very belt of land so often condemned, which is nearer the equator than any part of Europe whatever, and contains, moreover, the greater part of all the deserts in the northern hemisphere. The areas classed as "desert" or "semi-desert," that is to say, those that receive less than 20 inches of rain in the year, actually form altogether three-fifths of all the land above sea level. And they are by no means negligible countries (a matter of immense importance to Australia, since a great part of our own area comes under that category); it was precisely in those desert and semi-desert areas that there arose, without exception, the ancient civilisations, both of the old and the new world.

Time does not permit me to refer in any detail to those great chapters in the mighty story of civilisation, and I regret it, because our education persistently ignores them, to concentrate upon the age of Pericles, from which we draw our civilisation, as though its splendour blotted out the equal grandeur of its predecessors.

To us, the Golden Age of Greece, as the source and origin of our own intellectual ascendancy, is the beginning of civilisation; as a matter of fact, it was the end product of all the mighty civilisations that had gone before it, not a few of which had transcended it, including that ancient Egypt that could declare to Solon that the Greeks, in their heyday, were "mere children, loud-mouthed and vain, with no knowledge of the past"; including the civilisation of India; and including those great empires that had repeatedly arisen in Asia Minor.

From time immemorial the Chinese were famous navigators. It is said that as early as A.D. 121 they had invented the compass and sailed the seas from the Persian Gulf to Canton, and from the Malay Peninsula to Australia, New Guinea, and the Philippines, in great junks capable of holding 600 to 700 men, so that the greatest part of the known world looked to China as "Mistress of the Seas." (Some months ago, many feet beneath the surface of a newly discovered gold mine in New Guinea, Australian miners were amazed to find a Chinese bell, one of the trade symbols of their age-long search for pearls and gold. At Port Darwin years ago, excavations for road building in virgin country revealed a Chinese plaque several feet beneath the roots of an enormous banyan, itself a foreign tree.)

Reaching the zenith of her civilisation before ours even began, China declined as a world power after the revolution of A.D. 878, when the foreign merchants were massacred or expelled (was it because they brought epidemic plagues in their ships?) and Chinese voyagers were rigorously restricted to the neighbouring shores. It was not until the thirteenth century that the Mongol invasion once more dragged her from her self-sought isolation into the great maelstrom of world commerce.

As for India, Mookerji points out that—

> For three centuries India stood out as the very heart of the Old World and maintained her position as one of the foremost maritime countries. She had colonies in Pegu, in Cambodia, in Java, in Sumatra, in Borneo, and even in the countries of the further East, such as Japan. She had trading settlements in South China, in the Malayan Peninsula, in Arabia, and in all the chief cities of Persia, and all over the East coast of Africa. . . . During the first few centuries of the Christian era an enthusiastic band of devoted Bengalis, burning with a proselytizing zeal, went so far as China, Korea, and Japan, carrying with them the torch of Buddhistic faith.

Her influence and dominions spread right through the Indonesian chain above our shores, where Chinese had preceded them and Arabs were to follow (and where, indeed, in the Torres Straits, by some dim chance, Egyptians had left the detailed processes of mummification as used in Egypt in the twenty-first dynasty, to be the burial practice of a savage native tribe on Darnley Island).

The Hindus excelled all the nations of antiquity in operative surgery and four hundred years before Christ they had highly developed medical and sanitary systems and public hospitals. Malaria was known and attributed to mosquitoes, a discovery remade by Ross less than

forty years ago; the recently recognised association of rats with plague was observed and recorded; and several other diseases of recent investigation, as, for example, diabetes, were, we are told by Garrison and Jolly, recognised and dealt with. Their methods of operating for cataract, skin grafting, and certain other procedures were adopted into present-day European medicine, and they have provided us with numerous effective drugs for our pharmacopœia.

Apart from these civilisations, we often forget that there is no direct descent between ancient Greece and modern Europe. . . .

It was not until the Arabs from the deserts of Asia Minor burst through the Dardanelles that the learning that had stagnated for a thousand years broke into belated flower. The amazing rise of Europe was to that epoch what the rise of Japan has been to this.

But meanwhile, for a period as long as that during which Great Britain has been a world power, and considerably longer than that during which the United States of America has been in existence, the burning sands of Asia Minor and Africa bred a race of warriors, scientists, and missionaries equal to any later series.

The religion of Mohammed aimed at the conquest of the world, and in less than a century it had actually conquered the world from the Atlantic to the Himalayas and, we are told, but for the sudden death of a caliph, would probably have extended its sway to the Pacific. As Beazley says—

> The last of the Ommiades (A.D. 750) reigned over three-quarters of the empire of Alexander and a quarter of the dominion of Trajan . . . No race has ever shown a greater keenness for the acquisition of knowledge or more favour to the growth of science.

Arnold Wood has added that—

> While Europe sat in darkness, Baghdad became the centre of a splendid civilisation.

In the ninth century the Greek and Roman classics had already been translated into Arabic and had become the inspiration of native Arab scientists, who in their turn, though not until four hundred years later, became the teachers and masters of Christian scholars like Roger Bacon.

Arabian travellers co-operated with Arabian men of science and surveyed every sea from Spain to China, from Cairo to Madagascar, from Java to Canton. Arabian merchants traded and colonised on the east coast of Africa, on the west coast of India, in Sumatra, in Java, and in China. Immediately north of Australia's shores is a little island, west of the Philippines, in the Pelew group, which in its Arabic name of Bab-el-thaob, or "Gateway of the East," demonstrates the far-flung limits of the Moslem power. Well might Sir William Hunter write that "the Indian Ocean became an outlying domain of Islam."

When one turns unbiased attention to these other civilisations which now seem so remote—and perhaps in their remoteness and in our ignorance somewhat trivial—it is difficult, but essential, to realise that it is only six hundred years since the Europe of to-day began to rise from the chaos of semi-civilisation; that it is less than three hundred years since England became a first-class power; and that at that golden age of Greek dominance from which we trace the very phrases, ideas, and habits of thought that mould so much of our public policy, and colour so much of our national outlook, Britain, and indeed all north-west Europe, was primitive to the stage of sordid misery.

The climate has not changed in this tiny section of history. To regard it as the causative factor in Great Britain's rise to power is obviously ludicrous.

To what, then, is due the present eminence of the Anglo-Saxon race, British and American, with its colonies and dominions in every continent?

Every human factor is complex, but to this question we must answer in all humility that one very large element at least was the rounding of the Cape of Good Hope by Vasco da Gama, a Portuguese, and the discovery of America by Columbus, an Italian sailor in the service of Spain.

British history may be said to have begun when those discoveries produced the maritime revolution that closed the middle ages, the revolution that transferred the centre of world politics from the Mediterranean to the Atlantic, effectively and finally checkmating the Mediterranean nations which had monopolised trade with the East through that land-locked sea, and the Moslem, who, by his possession of Asia Minor, had cut the whole of Europe off from the Indian Ocean. Britain, as isolated as Australia, became suddenly the ideal seat and centre for the Atlantic trade, and in one century (and without, mark you, any change of climate) sprang from obscurity to the status of a first-class power.

With trade came wealth, with wealth came food, and with food, health.

There is a whimsical parallel and contrast between ancient Britain and the Australia of 1788, as we know them from contemporary authors.

Australia, we were assured, was one of the poorest of countries, isolated "for ever" from centres of trade, with no natural fruits, with no animals but the dingo and the kangaroo, with a summer climate that was intolerable, and with a vegetation that was no more than a vast monotony of grey-green gums, interspersed with dreary swamps and miles of drab scrub; above all, said the critics, was a fierce sun in a brazen sky, with blinding sunlight and a parched soil never moistened by rain.

The Britain of two thousand years ago was utterly unlike the ideal Britain of our tradition or the man-made gem of to-day. It was, as Vergil said, isolated "for ever" from civilisation by rough seas; it had no fruits but the bitter and uneatable crab apple, and no animals but the wolf. It had great areas of dreary swamp and fen, and a winter climate that the hardy Roman soldiers dreaded worse than death. As for the vegetation, throughout all Europe it was no more than a dreadful monotony of beech, elm, chestnut and oak, that from the northern slopes of the Alps to Ultima Thule buried the country beneath a grey-green pall, rendered ever more melancholy by the lowering skies, the utter sunlessness and the perpetual dripping of the endless rains that soaked its sour soil.

And what of it to-day?

As Emerson says—

> England is a garden. Under an ash-coloured sky the fields have been combed and rolled till they appear to have been finished with a pencil instead of a plough. The solidity of the structures that compose the towns speaks the industry of ages. Nothing is left as it was made. Rivers, hills, valleys, the sea itself, feel the hand of a master. The long habitation of a powerful and industrious race has turned every

rood of land to its best use, has found all the capabilities, the arable soil, the quarriable rock, the highways, the byways, the fords, the navigable waters; and the new arts of intercourse meet you everywhere; so that England is a huge phalanstery where all that man wants is provided within the precinct.

What wrought this change in what had been that age-old monotony of beech and oak: Nature, or man setting Nature at defiance?

The story of the human will and human industry that have extended the vegetation of the tropics and the semi-tropics to redeem the colder reaches of the earth from their barren bleakness, is the main theme of civilisation.

The ancient Pharaohs took advantage of their foreign expeditions to introduce exotic plants into Egypt, and were so well aware of the glory due to men who bettered or outwitted Nature that they took to themselves for so doing titles of honour, that we still may read inscribed on their ancient monuments.

By systematic and studied acclimatisation they collected within their country from Western Asia an enormous quantity of plants for food, for industry, and for pleasure, and distributed them, moreover, to all their allies and neighbours. Upon the naturally rugged coasts of a Mediterranean we have never known they grafted that artificial landscape we regard as "typical of Southern Europe." Can you imagine an Italy bare of the olive, the vine, the oleander, the cypress, the plane tree, the lemon, the orange, the almond, the peach, and the mulberry? Yet so it was until Egypt remade it. To all these the Romans added from their conquest the apricot and the pomegranate, among a host of lesser fruits and flowers, and from Italy they carried their fruits to enrich and remodel all Western Europe as far as the Rhine and the Danube, grafting fragments of a new kind of country—a new kind of climate—on natural areas whose disparity with them was complete. In its new French homes, for example (and in spite of the prophecies inspired by that pessimistic conservatism that seems inseparable then, as now, from the academic-minded), the vine flourished so exceedingly everywhere that in the middle ages a canton of Toulon-sur-Arroux "took its name (Sanvignes) from its almost unique incapacity to nourish that plant of hot climates" (Lefèbvre).

The olive similarly, foreign to both Italy and Africa until two centuries after the foundation of Rome, had been naturalised there so successfully that it became the commonest of fruits and now was carried "with painful care into Spain and Gaul" (Gibbon).

Flax, too, was transported to Gaul from Egypt, and enriched the whole country; and the use of artificial grasses, including in particular lucerne (which came originally from Media in Asia Minor), became a familiar boon to European farmers.

In Britain, however, up to the end of the middle ages, the process was rudimentary and famine always followed a bad harvest. During the winter there was not enough pasture for the flocks, and it was the custom to kill and salt, smoke or dry the flesh of all but the best beasts. Even so, the people's ration was so meagre that scurvy was appallingly rife. The introduction of new fruits, vegetables, and fodders from abroad—the most permanent of the "fruits of conquest"—came with the maritime revolution and England's consequent rise to world power. To the curious student her importations set her former poverty in high

relief. Plimmer points out, for example, that the use of greens and salads was introduced only by Catherine of Aragon, wife of Henry VIII., and that, as the English were ignorant of the growing of greens, she was forced to import a gardener from Holland, where possibly the people had learned the art while subject to Spain.

The potato, so important a factor in our everyday life, was brought to England from its home in the dry Andes of South America in 1565 (and incidentally was regarded at the outset with indignant hostility as "unchristian" pig food); while the planting of root crops, such as the turnip, dates only from the middle of the seventeenth century.

Custom turns a casual corner and civilisations rise or fall.

Osborne, commenting on the decline of Rome, once pointed out that no description of the causes that bore down that mightiest of empires was complete if it omitted "Baltic herring and Egyptian wheat." No history of the rise of Great Britain is perfect if it omit the introduction of the foods that permited her flocks and herds to be carried safely through the winter and added to the diet of her people those elements that foster vigour and initiative. For 3,000 years the potent British stocks lay latent in an obscure island; in three hundred they overran the whole globe.

When, less than a century ago, the microscope conquered superstition, science found the Anglo-Saxon in every climate clinging grimly to half the world. The coloured races of the tropical lands laid luxurious tributes at the feet of their new lords, and the diseases rife in their new dominions struck them down in thousands as they took them up.

In the West Indies, for example, 3,000 white men died in one small island in one year; and in Africa and in India the record was no less dreadful. It is recorded that a King's ship "Tiger," cruising on duty off the Barbadoes, out of a crew of originally 220, lost 600 men from yellow fever in two years, the master of the vessel, as he reported, "still pressing men out of merchant ships that come in, to recruit my number in the room of those who died daily."

The lot of the soldier in India makes startling reading. Statistics are out of place perhaps in a lay oration, but you will permit me a moment's latitude to take you back a century. From 1832 to 1838, inclusive, in Fort William, India, out of every 1,000 soldiers there were 1,883 admissions to hospital every year, and the annual deaths were seventy-three. At Chinsurah depôt, 12 miles from Calcutta, from 1826 to 1837, of every 1,000 of the troops there were 1,930 admissions to hospital, with 73.7 deaths annually. That was the mortality on the spot only, and does not include the invalids who died on the passage to England or shortly after their arrival there; these were sufficient to bring the deaths to more than eighty per 1,000 annually. As service in India is permanent, or, rather, leave of absence was allowed to those who chose to return to Europe for three years after ten to fifteen years of service, it will be noted that in the tenth year less than two hundred would survive out of every 1,000 soldiers sent to India.

And what were the diseases? They were diseases that at the present day are almost wholly preventible. Out of every 1,000 soldiers dying in Bengal, Burke stated that 268 died from "fever," 378 died from bowel complaints and liver abscesses, 195 died from cholera, 46

died from tuberculosis or other respiratory diseases, leaving a meagre total of 110 in every 1,000 to die from every other kind of disease whatever.

I have already referred briefly to the fact that as recently as the girlhood of Anne MacKenzie it was commonly accepted that the causes of epidemic fevers and diseases were either cosmic, atmospheric influences, or miasms from " the bowels of the earth"; that the localisation of particular forms of disease was supposed to be due to "local peculiarities" of men and climates; and that, as William Stokes (1804-1878), following Sydenham, asserted, diseases were not specific and separate but that "the same exciting cause is capable of producing different kinds of fever in different persons."

Since no distinction was known between fevers, except the mere fact of locality, all were treated alike, and the death rate was enormous. The treatment was directed towards expelling the supposed evil matter, and was as follows:—First, repeated bleeding, 25 to 50 oz. of blood being withdrawn (and many a patient was bled to death, as is obvious from the case notes); secondly, violent purgation; thirdly, cold and tepid affusions; fourthly, mercury, pressed to the point of poisoning and the production of salivation; fifthly, violent emetics were used to reinforce the effect of violent purges (though this was passing out of favour); and sixthly, diaphoretics were used to "sweat the poison from the body," to use the present day phrase of the man in the street. In the last stage of treatment tonics and stimulants, including quinine bark, wine, and opium, might be employed.

The only drug valuable in malaria—and malaria must have represented a very great proportion of all the cases—is mentioned in one word on one page in an account of the treatment of fevers that traverses nine pages of close print. It is not otherwise referred to, except in condemnation, in Johnson and Martin's standard text-book of 1841, though Johnson states that, on account of the variability in symptoms seen, he "shall not attempt to deny that there may be cases wherein the the use of wine, and even bark (quinine) is indispensable."

Into this tragic confusion came the microscope, a magic index of bacteria and parasites, that steadily and rapidly dispersed that comfortable smoke screen of ignorance, "climate," replacing it by clear pictures of visible causes.

As early as 1546 Fracastorius, a famous Italian doctor, had, so Garrison tells us, described contagion as being due to "*seminaria contagionum*"—germs—that were able to grow and multiply; and had quite clearly expounded the relation between infection and epidemics. Nevertheless, it was only between 1870 and 1900 that a series of brilliant successes decided the struggle between science and the speculative philosophy that had usurped the throne of scientific observation.

In 1872 Lewis in India discovered that the micro-filaria lived normally in the blood of persons infected with filariasis and the fever that accompanied it; in 1873 Obermeier saw first the spirochæte that is the essential cause of relapsing fever; and in 1874 Hansen demonstrated the bacillus of leprosy. In 1878 Manson, the "Father of Tropical Medicine," found that a mosquito, an insect vector, was the indispensable carrier that conveyed filariasis from man to man. He had effected a revolution in medical thought.

From 1880 to 1894 there were determined, among other things, the causative organisms of suppuration, typhoid fever (1880), malaria (1880), glanders (1882), tuberculosis (1882), cholera (1883), diphtheria (1883-4), tetanus (1884), undulant (Malta) fever (1887), cerebro-spinal meningitis (1887), and plague (1894); and man, running hot-foot in the sudden consciousness of victory, soon discovered how to outwit Nature by protective inoculation against anthrax, tetanus, hydrophobia, cholera, diphtheria, and typhoid.

Three years later (1897), Shiga and Kruse had detected the germ cause of bacillary dysentery, and Tictin had found that relapsing fever was conveyed by the bed bug, the louse and the tick being incriminated also later. But in that year (1897-8) Ronald Ross, on Manson's advice, and with his encouragement, finally demonstrated the rôle of the mosquito in the transmission of malaria, and for the first time laid down the measures that would ultimately vanquish that "principal and gigantic ally of barbarism."

The microscope revealed and classified ever-increasing numbers of parasites from the blood, the body tissues, the urine, and the bowel contents; while in the laboratories scientists grew on culture media the "demons that produced corruption of the air and pestilences" and bottled in test tubes the different organisms whose varying effects on the human body had been ascribed to "differences due to climate."

Thus, in the short span of thirty years, climate was absolved from the burden of guilt it had borne unjustly for thirty long centuries.

In the tropics the effect of this new lead in scientific thought was enormous. With the development of national greatness social standards had so improved in Great Britain during the previous two hundred years that the commoner epidemic plagues had largely disappeared; leprosy had gone with the middle ages, plague disappeared after 1680, malaria was increasingly rare, and cholera only an occasional dreaded visitant. But among the teeming poor of the rich and populous East, the most fatal plagues were still so common that, forgetting Europe's former subjection to these same scourges, they were called "tropical diseases." I must emphasise that point.

Many diseases called "tropical" are merely diseases which have their greatest distribution where social and sanitary conditions are primitive, or grossly defective, and nowhere is this the case more than in the tropics. Plague, cholera, typhus, smallpox, dysentery, leprosy, and malaria have all raged at times in Europe and were only recently controlled, some foci still existing. It was in the tropics, however, that they were rampant, and it is to the tropics that we look for those victories to which each year adds new examples.

Moreover, as Manson long ago pointed out, heat and moisture are responsible for an amazing fertility in tropical countries—in men, in animals, and in plants; and this applies equally to bacteria, parasites, and the insects that act as their vectors. Since the fly, the tick, the mite, and their more scandalous colleagues, the flea, the bed bug, and the louse, have been found equally guilty with the mosquito as porters of disease, it is obvious that in the areas of their greatest prevalence, and earth's greatest profusion, man must fight this grimmest battle for survival.

Before Hercules may win the golden apples of the Hesperides and the delights of Olympus, he still must overcome the fiery dragon that guards the tree and the many-headed Lernean hydra of the swamp.

Here, perhaps, we may spare a crumb to the protagonists of climate and set it in its true perspective, for here, perhaps, is that grain of fact in a bushel of fiction that led the world in its ignorance to set all diseases at its door. Newsholme points out that:—

In England mild winters and cool summers lower the death rate, the former by decreasing catarrhal infections, and the latter especially by reducing the prevalence of diarrhœa. Hot and dry summers favour the occurrence not only of fatal diarrhœa in the summer, but also of enteric fever in the autumn of the same year. But recent experience shows that hygienic measures are competent to reduce or even to annihilate any excess of these diseases favoured by climatic conditions. Typhus fever and smallpox prevail chiefly in the winter and spring; but they are completely avoidable at all seasons. Pneumonia is much more prevalent and fatal after a cold snap accompanied by fog; and this has been ascribed to the absence of sunshine; the chief agent in causing this result, however, is the low temperature, affecting in particular those of extremes of age, with lowered vitality. Differences of prevalence of disease associated with climatic differences are well known, as, for instance, in rheumatic fever, scarlet fever, diphtheria, and tuberculosis; but in most instances—and still more is this true for the tropical parasitic diseases—the difference is controllable.

Newsholme might have added that the warmth and moisture of the tropics are essential to the presence of the hookworm—that great devitalising factor in native (and even white) communities—a disease that is the only present threat to white colonisation in tropical Queensland (where, up to the withdrawal of the Commonwealth last year from the campaign for control, it had already cost the country £180,000).

Cholera in India has been found by Rogers to be able to reach epidemic proportions only when the degree of atmospheric humidity has reached a certain figure; yellow fever in Central America requires for its development in epidemic form a mean atmospheric temperature of 75 degrees F., and will not spread below it. It is favoured by damp and stopped by cold. Martin and Bacot, in India, demonstrated that the duration of life of *X. cheopis* when fasting was determined by saturation deficiency, and Rogers recently called attention to the fact that a low saturation deficiency meant a high incidence of plague and a high saturation deficiency a low incidence. On all such information forecasts of epidemic probability can be made in these and in other diseases, for investigators, with patience and skill, have determined an infinite number of other minute differences in the life history of parasites and their insect vectors, upon which, to an extent undreamt of, depend the effective implantation, the endemicity, or the epidemic spread of various diseases.

This, then, is the new trend of medical and scientific thought that I present to you. How can we best apply it?

Newsholme answered the query when he said that there is always some controllable aspect of the case; in the tropics this is not only true, but it is the basic problem of progress.

Unless the administrations of tropical countries make health everything, disease makes them nothing.

Time permits me only the briefest illustrations. Nicholls has shown how surely the former civilisation of Ceylon that spread its magnificent monuments from that island throughout the Indonesian chain above our

shores, was destroyed a thousand years ago by the malaria and the hookworm disease that still flourish triumphantly among their ruins; Jones has demonstrated the rôle of malaria in the fall of Greece and of Rome; the history of India is one long catalogue of such disasters; and in the earlier days of South and Central America the white man was repeatedly pushed from his supremacy by yellow fever. Every kind of explanation has been advanced by arm-chair speculation to account for the patchy distribution of the Polynesian and Melanesian races here in Oceania—skin colour, climate, ocean currents, and a dozen others—but it is perfectly obvious that it is the absence or presence of malaria that has determined the local survival or extinction of the Polynesian.

I have chosen Indonesia and Oceania as examples because the factors operative may be studied in the island chains that bound our shores from Java to Fiji, and because one example is the story of the ruin of a great civilisation and the other is largely the explanation of the barren history of New Guinea.

In the great Melanesian chain, in a climate that will grow in profusion almost every tropical product, we are amazed to find primitive and undeveloped tribes on whose shores the successive waves of eastern and western civilisations have spent themselves in vain since the dawn of history. Perhaps nowhere is there a better illustration to-day of the blind brutality with which disease factors and food deficiencies together chain man down to mere animal existence.

The reference to food deficiencies recalls the recent triumphs in the field of dietetics.

Just as the outstanding achievement of last generation was the isolation of the specific bacteria that caused epidemic disease, so the research in this generation that has most seized the attention of the public is the discovery of the unsuspectedly intimate association that exists between food and health. No one now doubts the relation of scurvy, beri beri, and rickets to the lack of some essential constituents in the diet, or denies the existence of the substances called vitamins. But researches into nutrition have demonstrated, even more importantly, that, apart from the prevention of frank disease, a balanced and adequate diet is essential to the vitality of mankind, with all that that implies in fertility, resistance, manliness, energy, and initiative.

Thus McCollum and Simmonds assert with conviction that, short of producing obvious disease, an improperly constituted diet is an important cause of—

> Inferiority in physical development, instability of the nervous system, lack of recuperative power and endurance, with consequent cumulative fatigue; and lack of resistance to infections such as tuberculosis, and other types where specific immunity is not easily developed by the body. In addition to these, the rate of development of senile characteristics and consequently the length of the span of life are greatly influenced by the type of diet to which one adheres.

In New Guinea these hypotheses are amply confirmed not only so far as the natives are concerned, but also among those white men who live on tinned foods. Food deficiencies double all hospital costs; and, indeed, all overhead expenses, by enormously diminishing the efficiency of labour.

How could it be otherwise with the natives at least, whose diet in their own villages, even at its best, is bulky, innutritious, and deficient in fat and in protein, hard to digest with its 15 per cent. to 50 per cent.

of contained fibre, and poor in vitamins A and C? At its best its deficiencies are made up for the more powerful members of the tribe by the growing shoots of plants, certain seedy grasses, ferns and fruits, with the raw liver of fish, or, rarely, of animals, formerly even of men. At its worst it is a compromise with famine, and not always a successful one.

With endemic diseases that prevent all but a minimal foraging for food or cultivation of the soil, and with a consequently faulty diet that still further lowers bodily resistance to those very diseases, is it any wonder that the native often reaches a stalemate, where initiative and industry are lost in the mere struggle for survival?

Nor does the coming of the white man aid him at the outset. The first impact of civilisation is actually to intensify native disabilities, for in New Guinea, it introduced tuberculosis, dysentery, and venereal disease; while disruption of the social organisation of native communities and the introduction of plant pests still further limited foodstuffs. Nevertheless, if we will use them, we can to-day lay the whole world under tribute to redress the balance, for both the diseases and the deficiencies are controllable, though admittedly control is a complex problem.

It is the conquest of environment, and is not this what I called just now the main theme of civilisation? Should not, is not, the whole fabric of social progress built about the co-operation of the producer, the defender, and the equitable distributor of work and wealth, or, as one may more aptly put it for a subject native province threatened with disease and famine, the co-operation of the medical man, the agriculturist, and the anthropologist?

The basic problem in every native community is the problem of health, and medical science has won many victories since Manson, Ross, Reed, Bruce, Rogers, and a host of others brought promise out of chaos. One can do no more than mention the progress that has been made in the control of malaria, hookworm disease, smallpox, plague, cholera, dysentery, relapsing fever, typhus, leprosy, and a host of others. Schistosomiasis yields to the antimony treatment elaborated by Christopherson, while the work of Leiper and others has shown that the parasite develops in water snails vulnerable to attack. Kala azar, which often decimated the richer populated tracts of Bengal and Assam, killing 90 per cent. of those it attacked, has in the last few years succumbed also to the curative properties of intravenously administered antimony. There is the greatest promise in the success that has been secured in the treatment of sprue by lessons learned in the special field of endocrinology. Cholera and plague may now be rapidly stayed by prophylactic vaccines, while the epidemic distribution of the former may be anticipated with certainty and prevented by adequate measures; and rat control and examination are a sound check on the latter. Emetin and other products have enormously reduced the ravages of amœbic dysentery while synthetic chemistry continually adds to the resources available to the physician in the treatment of almost every tropical disorder.

In the field of plant life the endless story of beneficent interchange between the tropical and the temperate regions goes on unceasingly.

I have referred previously to the part Egypt played in remoulding the countries of the Mediterranean from the rich plant life of Western

Asia; to the dissemination throughout all Europe of those benefits by the Roman conquests; and to the continual additions that have varied life, ameliorated hardship, and multiplied resources since the great tropical areas of the old and new worlds were thrown open by explorers and traders.

In the last 300 years, and especially in the last century, our dependence upon the tropics has grown to an enormous extent—an extent that is masked by long every-day familiarity. We draw on the tropics for such common articles as our indispensable beverages—tea, coffe, and cocoa; the coconut oil that produces many of our soaps, the tung oil that blends the paints of our houses, and all kinds of fibres of industrial importance, such as sisal-hemp, cotton, silk, jute, kapok, and so on. From the tropics we have obtained hundreds of medicinal drugs, spices, aromatics, and dyes, as, to give the first examples that occur to me, quinine, castor oil, ipecacuanha, quassia, strophanthus, ephedrine, chrysarobin, chaulmoogra oil, and camphor; sugar, pepper, nutmeg, cloves, cinnamon, cochineal, coconut, and curry powder. The veneer woods of the tropics are general in our homes, and fruits such as bananas, pineapples, and dates are common on our tables; sago, tapioca, and rice are universal, while rubber, both raw and vulcanised, has infinite uses, from pavements to palates.

Moreover, many tropical products have been successfully adapted to actual growth in temperate climates, and, apart from the potato, include melons, beans, sweet potatoes, ginger, tobacco, rice *et cetera*, besides oils, nuts, gums, and fibres in great variety.

From the enormous resources of the tropics the mechanical ability and initiative of progressive races are daily adding new comforts and resources to civilisation, besides improving the product itself. Immediately above our shores the Dutch in Java have cultivated cinchona to such excellence that they have transplanted quinine production from the Andes to the East Indies; and in like manner rubber growing has been taken from the Amazon to the Orient, while Java produces a better palm oil than Africa does.

I select these examples because they occur in the great Indonesian chain with which our tropical possessions are continuous.

In Australia, beginning from the other end of the scale, we have queerly reversed the process of adaptation. The tenacity of our explorers and pioneers gave us a heritage stretching from the equator through more than 40 degrees of latitude (a heritage extended last month to the South Pole itself), and the conservatism we inherited no less from our European ancestors harnessed it to the task of growing English products in the English way for the English-speaking markets. Indeed, holding as an article of faith the idea that white men cannot live in the tropics, Australia, paradoxically, has not only successfully implanted her people for several generations in a tropical and subtropical land, but has coerced it into the semblance of the homelands from which we have come. We have taken a country that, climatically speaking, is everywhere utterly different from the British Isles and that, with the exception of the tiniest moiety of South Victoria, is everywhere closer to the equator than any part of Europe whatever, and in those areas that pre-eminently owe their allegiance to the tropics we have produced in increasing profusion the fruits and products of temperate and even cold lands.

Man once again has demonstrated, as Lefèbvre claims, that—

Humanity escapes more and more from blind determinism, from the mechanical causality of his environment. Man is more and more the master of Nature and would be still more so did he utilise better the resources he has created, and had he a less vacillating idea of civilisation.

In that struggle for progress which, I repeat, is pre-eminently the establishment of a beneficial accord between man and his constantly changing environment, human will is the dominating factor, and nowhere perhaps is this more important than in the Australia of this and the next generation.

We claim exclusively a semi-tropical and tropical continent, originally free from endemic disease; we have the suzerainty in New Guinea of a native dependency that can be to Australia what the Dutch East Indies have been to Holland; we stand perhaps on the threshold of events as revolutionary as those that transferred the seat of world interest from the Mediterranean to the Atlantic, for events are every day more clearly demonstrating the increasing importance in world politics of the Pacific. The conquest of tropical disease has placed in our hands the key of our destiny, and we may well take stock of our responsibilities and our resources.

Lawrence Lowell said some years ago—

It is hardly an exaggeration to summarise the history of four hundred years by saying that the leading idea of a conquering nation in relation to the conquered was, in 1600, to change their religion; in 1700, to change their trade; in 1800, to change their laws; and in 1900, to change their drainage. May we not say that on the prow of the conquering ship in those four centuries first stood the priest, then the merchant, then the lawyer, and finally the physician?

It is true, but there is a greater lesson: in that greatest of all the problems that confront Australia—the demonstration to the world that we are capable of developing successfuly the greatest remaining accessible tropical area, and of bringing the scattered tribes of Melanesia out of their wilderness of famine and disease into the security of settled government and productive life—we require the intimate co-operation of all four, though, truly, with the recognition of the fact that, in tropical lands, health is the foundation upon which every other developmental activity must rest.

In Australia we have a greater population, purely white, living in the tropics than any other country in the world can boast, and these white men and women of the second and third generations live there without any loss of mentality, physique, or fertility. It is the demonstration to the world (admittedly largely an unconscious experiment, successful owing to the absence of any teeming native population riddled with disease, but, nevertheless, an outstanding demonstration) that the conquest of climate is primarily, essentially, the conquest of disease.

That once achieved, we may say, as Shelley sings:—

All things now are void of terror: Man has lost
His desolating privilege, and stands
An equal amongst equals. Happiness
And science dawn, though late, upon the earth;
Peace cheers the mind, health renovates the frame;
Disease and pleasure cease to mingle here;
Reason and passion cease to combat there;
While Mind, unfettered, o'er the earth extends
Its all-subduing energies, and wields
The sceptre of a vast dominion there!

—*Shelley*, "Daemon of the World," lines 458-467.

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesdays and Thursdays of each week, as from the 3rd April, 1934, a fifteen-minutes talk, commencing at 7.15 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures for April, May, June, and July, 1934:—

SCHEDULE OF LECTURES.

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, 3rd April, 1934—"The Control of Tobacco Diseases in the Field." By L. F. Mandelson, B.Sc. Agr., Assistant Plant Pathologist.

Thursday, 5th April, 1934—"The Deficiency of Winter Feeding on Natural Pastures." By J. L. Hodge, Instructor in Sheep and Wool.

Tuesday, 10th April, 1934—"Cabbage Pests." By J. A. Weddell, Assistant Entomologist.

Thursday, 12th April, 1934—"Health of Dairy Herds." By J. C. J. Maunder, B.V.Sc., Veterinary Surgeon.

Tuesday, 17th April, 1934—"Lucerne Diseases." By R. B. Morwood, M.Sc., Assistant Plant Pathologist.

Thursday, 19th April, 1934—"Prevention and Treatment of Some Common Ailments of Dairy Cattle." By J. C. J. Maunder, B.V.Sc., Veterinary Surgeon.

Tuesday, 24th April, 1934—"Some Breeds of Poultry." By P. Rumball, Poultry Expert.

Thursday, 26th April, 1934—"Principles of Housing Poultry." By J. J. McLachlan, Poultry Inspector.

Tuesday, 1st May, 1934—"Squirter Disease of Bananas." By J. H. Simmonds, M.Sc., Plant Pathologist.

Thursday, 3rd May, 1934—"Working and Care of Separators." By F. J. Watson, Instructor in Dairying.

Tuesday, 8th May, 1934—"The Profitable Life of a Fowl." By P. Rumball, Poultry Expert.

Thursday, 10th May, 1934—"Replacement of Poultry Flocks." By J. J. McLachlan, Poultry Inspector.

Tuesday, 15th May, 1934—"Apiary Equipment." By Henry Hacker, Entomologist.

Thursday, 17th May, 1934—"Care of Cream on the Farm." By F. J. Watson, Instructor in Dairying.

Tuesday, 22nd May, 1934—"Problems of the Dairying Industry." By C. F. McGrath, Supervisor of Dairying.

Thursday, 24th May, 1934—"The Scientific Use of Stock Licks for Sheep." By J. L. Hodge, Instructor in Sheep and Wool.

Tuesday, 29th May, 1934—"Fat Lamb Raising as Combined with Agriculture." By J. Carew, Senior Instructor in Sheep and Wool.

Thursday, 31st May, 1934—"The Effect of Parasites in Sheep and Methods of Control." By J. Carew, Senior Instructor in Sheep and Wool.

Tuesday, 5th June, 1934—"Pineapple Wilt." By H. K. Lewcock, M.Sc., Assistant Plant Pathologist.

Thursday, 7th June, 1934—"The Frozen Pork Trade." By E. J. Shelton, Senior Instructor in Pig Raising.

Tuesday, 12th June, 1934—"Insect Pests of Ornamental Trees and Shrubs." By A. R. Brimblecombe, Assistant to Entomologist.

Thursday, 14th June, 1934—"All Fresh is Grass—A Great National Asset." By J. F. F. Reid, Editor of Publications.

Tuesday, 19th June, 1934—"Selection and Mating of Poultry." By P. Rumball, Poultry Expert.

Thursday, 21st June, 1934—"Rearing and Feeding Chickens." By J. J. McLachlan, Poultry Inspector.

Tuesday, 26th June, 1934—"Grain Pests." By Robert Veitch, B.Sc., F.E.S., Chief Entomologist.

Thursday, 28th June, 1934—"Grading Pork and Bacon Carcasses." By E. J. Shelton, Senior Instructor in Pig Raising.

Tuesday, 3rd July, 1934—"Results of Disease-resistance Trials with Cane Varieties." By A. F. Bell, Sugar Pathologist.

Thursday, 5th July, 1934—"Intensive Cane Cultivation and Costs of Production." By Dr. H. W. Kerr, Director, Bureau of Sugar Experiment Stations.

Tuesday, 10th July, 1934—"Preparing Pigs for Show." By L. A. Downey, Instructor in Pig Raising.

Thursday, 12th July, 1934—"The Principles and Practice of Pig Feeding." By L. A. Downey, Instructor in Pig Raising.

Tuesday, 17th July, 1934—"Plants Poisonous to Stock." By C. T. White, Government Botanist.

Thursday, 19th July, 1934—"Plants Poisonous to Stock." By C. T. White, Government Botanist.

Tuesday, 24th July, 1934—"A Ramble in Rural England and Its Lessons." By J. F. F. Reid, Editor of Publications.

Thursday, 26th July, 1934—"An Excursion to Scotland—Live Stock Studies." By J. F. F. Reid, Editor of Publications.

Tuesday, 31st July, 1934—"Queensland—A Fruitful Country." By J. F. F. Reid, Editor of Publications.

OUR TRADE WITH GREAT BRITIAN.

The annual report of the Australian Association of British Manufacturers makes interesting reading. It shows, for instance, that Great Britain's percentage of Australia's imports has increased from 38.4 per cent. in 1930-31 to 39.5 per cent. in 1931-32, and to 42.1 per cent. in 1932-33, which is larger than that of 1929-30. It states also that, in the Commonwealth, tariff reduction has coincided with a period of substantially increasing employment. The Ottawa Agreement is discussed, and the hope expressed that from now on programmes of inquiries arranged by the Board will consist largely of matters that are dealt with as the result of specific requests my United Kingdom interests, through the British Government. One of the most serious developments of the past year, it states, is the phenomenal growth in the intensity of Japanese competition with British goods in the Australian market, and the report urges that the provision that all imported china and earthenware must be indelibly marked to indicate the country of origin, which came into force on 1st September, 1933, should be extended to cover other goods in which British manufacturers are faced with intense foreign competition. In regard to certain piecegoods, words indicating origin are to appear, after 1st February, 1934, on the selvedge of the cloth, every two or three yards. The association has also urged that action should be taken by the Australian Government under the Industries Preservation Act and "dumping preference"duties be imposed on goods from countries with depreciated currencies. But the Government is faced with difficulties in view of Australia's highly favourable trade balance with Japan.

What should have been one of the principal tasks of the Ottawa Conference seems to have been unaccountably overlooked—the setting up of a central general committee to study and advise on the problems arising now that the Dominions and Colonies and the United Kingdom are being linked together, more or less, fiscally and economically. Recent experience raises the problems of South African Government subsidies to Italian shipping, the importations of manufactures from the Far East, and the question what can the Far East take in return, to say nothing of inter-Empire competition in Colonial markets. Mr. Bruce, the Australian High Commissioner in London, now suggests that such a body should be created to study these and other complicated problems. If misunderstanding is to be prevented and grievances assuaged, such a body is indispensable.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock, which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Ayrshire Cattle Society, production charts for which were completed during the month of February, 1934 (273 days period unless otherwise stated).

Name of Cow	Owner	Milk Production	Butter Fat	Sire.
		Lb	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORN			
	MATURE COW (OVER 5 YEARS), STANDARD 350 LB.			
Empress 9th of Rosemount	C O'Sullivan, Greenmount	12,854 25	523 824	Bright Star of Cosey Camp
Star of Alfavale	W. H Thompson, Nanango	13,632 25	516 323	Greyleigh of Greyleigh
Beauty of Headlands	J. A. Heading, Clovna	11,905 013	500 649	Beauty's Lad of Hillview
Roan 8th of Oakvilla	H. Marquardt, Wondai	13,897 53	497 069	Victory of Greyleigh
Myra 4th of Kilbirnie	Macfarlane Bros , Radford	12,919 77	492·373	Redman of Burton
Daisy 9th of Oakvilla	H. Marquardt, Wondai	10,705 06	414 34	Victorious of Oakvilla
Coronation of Happy Valley	R. Radel, Biggenden	8,575 25	351 56	Guiding Star of Blacklands
	JUNIOR, 4 YEARS (UNDER 4½ YEARS), STANDARD 310 LB.			
Pigeon 16th of Upton	H. Marquardt, Wondai	12,300 22	440 954	Kinsman of Greyleigh
Carnation X. of Oakvale	S. H. Teese, Veresdale	10,005 45	382 510	Mallow of Oakvilla
	JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.			
Mountain Home Olive	M C Lester, Laidley Creek West	8,885 75	333 296	Headlight of Greyleigh
Flower Girl of Blacklands	A. Pickels, Wondai	7,140 55	309 391	Fussy's Monarch of Hillview
	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB			
Envy 8th of Blacklands	A. Pickels, Wondai	7,697 45	299 864	Fussy's Monarch of Hillview
	JERSEY.			
	MATURE (OVER 5 YEARS), STANDARD 350 LB			
Shamrock Farm Jean	J. Hunter, Borallon	9,633 96	574 112	Shamrock Farm Palatine
Lindley's Creamery 4th	A Bulow, Mulgeldie	10,941	556 095	Lindley Billy Hughes
Kelvinside Ideal's Noble's Idol	R and J. Williams, Glencliff	8,141 1	486 598	Noble of Yaralla

SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB.				
Oxford Amy	E. Burton and Sons, Wanora	6,547 75	374 748	Trinity Ambassador
JUNIOR, 3 YEARS (UNDER 3½ Years), STANDARD 270 LB.				
Glenview Flora	F. P. Fowler and Sons, Coalstoun Lakes	4,739·6	295·133	Glenview Emperor
JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Bee of Inverlaw (365 days)	R. J. Crawford, Inverlaw	7,775·15	422·236	Bruce of Inverlaw
Glenview Echo Belle	F. P. Fowler and Sons, Coalstoun Lakes	5,270	338·134	Carlyle Larkspur's 2nd Emperor
Trinity Golden Wattle	A. Bulow, Mulgeldie	5,657	289·138	Trinity Field Marshal
Glenview Miss Etterey	F. P. Fowler and Sons, Coalstoun Lakes	3,946·95	255 235	Trinity Glenview Governor
AYRSHIRE.				
MATURE (OVER 5¼ YEARS), STANDARD 350 LB.				
C. F. Vixen	F. C. Maun, Yarranlea	10,454 8	396 638	Longland's Roland
JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.				
Fairview Ode	R. M. Anderson, Southbrook	10,489·88	413 052	Longland's Bonnie Willie I.
JUNIOR 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.				
Auchen Eden Rosebud	J. N. Scott, Camp Mountain	6,084·46	248 886	Benbecula Majestic

PLATE 118.—A CHAMPION MIDDLE WHITE SOW.

Conformation, quality, pedigree, temperament, all important qualifications in selection of breeding stock, are emphasised in this modern representative of the Middle White breed.

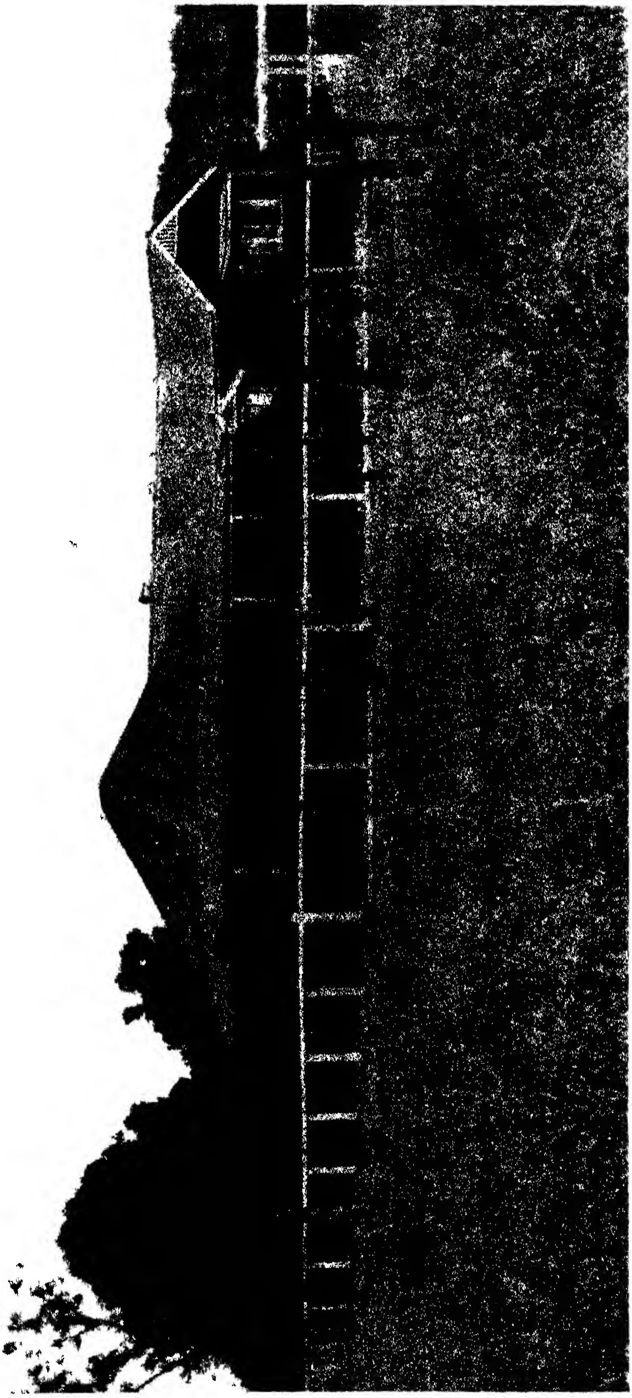

PLATE 119.

A picturesque farm homestead on the property of Messrs. P. C. Gorrie and Son, Esk, Brisbane Valley.

Photo. by courtesy Brisbane "Courier Mail."]

PLATE 120.
Obi Obi Creek, Queensland.

[*Photo. by courtesy Brisbane "Courier-Mail."*]

Answers to Correspondents.

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. Cyril T. White, F.L.S.

Western Grasses.

McN. (Charleville)—

1. *Brachiaria piligera.*—This grass is very common in Western and Northern Queensland. It is a native species, but so far as I have observed grows mostly on old cultivation lands, along railway embankments, &c., or, in fact, anywhere where the ground has been disturbed. It seems to prefer such situations to the ordinary pasture. It is quite a good fodder grass, but we have not heard a local name applied to it.
2. *Brachiaria Gilesii.*—This grass is fairly widely spread in Western Queensland, and, like the other species, rather favours country where the ground has been disturbed, but is not confined to such situations. We have had no experience with it as a fodder, but most of the *Brachiaria* are quite good fodder grasses, nutritious, and relished by stock.

   Brachiaria is one of the genera split off from Panicum.

A Beautiful Native Flowering Tree.

J.M.A. (Montville)—

The specimen is *Pithecolobium grandiflorum*, a native of Eastern Queensland, and a very beautiful native flowering tree. We have not heard a common name applied to it. The genus *Pithecolobium* is widely spread over the tropical regions of the world, and is abundantly represented in the forests of South America, where some of the species are known as Monkey's Earrings on account of the peculiar twist in the pod. The pod is almost as beautiful as the flower. It is yellow on the outside, becomes very twisted, splits open, is red on the inside, and has bright black seeds. These black seeds, showing up in contrast against the red background, are very effective.

Button Grass.

C.K. (Maryborough)—

The specimen is *Dactyloctenium ægyptium*, the coastal Button grass. This grass seems to be liked by stock, and is worth planting in seaside localities. It is of annual growth, however, and dies out on the approach of the colder weather. Usually it lasts till somewhere about the middle of March. It is very common in North Queensland, but is evidently on the spread southwards.

How Botanical Specimens Should be Sent.

Mr. W. WORTHINGTON, of Proserpine, writes:—

I am greatly interested in your description of grasses and plants in the "Queensland Agricultural Journal," and would like to send some to you to classify. Would you inform me how and what to send, do you require all the complete stool of grass or would the seed stalk do, also how to pack same. I am sure a lot of your readers would send on specimens if they had some instructions printed in the "Queensland Agricultural Journal."

Mr. WHITE'S reply:—

I would be very pleased to identify and report on any specimens of grasses and other plants you care to send me. Of grasses the whole stalk doubled up so as to fit comfortably in a piece of newspaper should be sent. It is as well to include in the folder several additional seed heads. Of weeds, trees, &c., a flower or seeding stalk a few inches long should be sent.

Specimens may be sent fresh, though there is always a big chance of their becoming mouldy in transit. The best way is to dry the specimens flat between several thicknesses of newspaper for several days before sending, changing the papers several times until the specimens are perfectly dry. When sending more than one specimen, each should be numbered and a duplicate retained, when names will be forwarded corresponding to the numbers.

Kangaroo Apple.

W.B. (Dalby)—

The plant is *Solanum aviculare,* commonly called Kangaroo Apple. It is a native plant that often comes up as a weed, particularly after a scrub burn. The berries are poisonous, and the young plants have also been regarded as poisonous to sheep. We would be very pleased to name and report any specimens you care to send from time to time. No charge is made for this service.

Guinea Grass.

T.T. (Birkdale)—

The grass is Guinea Grass, *Panicum maximum.* This is generally regarded as one of the best tropical grasses. For many years it did not seem to take on very well in Queensland, but judging from the number of specimens recently received, people seem to be taking a renewed interest in it. Stock are quite fond of it, and a small paddock of this grass for feeding down or cutting would be a decided asset. In Queensland it is often seen as a very common weed in orchards.

"Mistletoe Tree" and Other Poisonous Plants.

INQUIRER (Brisbane)—

The tree referred to as "Mistletoe Tree" is *Euphorbia tirucalli,* a native of Mexico, now cultivated as a succulent in most warm countries. The sap is very irritating, and if it gets into the eyes causes severe pain and temporary blindness. The branches, however, have to be broken, and if the plant is not overhanging paths no trouble should arise from it.

There are many plants commonly cultivated in gardens that are poisonous. One of the most commonly cultivated shrubs in Brisbane is the Oleander (*Nerium oleander*). The leaves of this plant are poisonous, and several cases of dairy cattle having been poisoned by trimming the bushes or by eating garden trimmings have come under our notice. A shrub cultivated fairly extensively is *Acokanthera,* more commonly known to gardeners as *Toxicophlœa.* The fruit of this is very poisonous. In the Botanic Gardens there is a tree, *Strychnos nux-vomica.* This tree fruits very heavily, but the seeds are the source of the very poisonous alkaloid strychnine. Some plants cause mechanical injury. The various Primulas, including *Primula malacoides,* give some people who handle them a severe skin rash, though other people are unaffected. One of the most popular plants is Bougainvillea, but the spines of this affect some people very badly if they happen to get torn or pricked by them. This list is not by any means exhaustive, and there are many plants cultivated in gardens which are dangerous, but surprisingly few accidents occur from them.

Spear Thistle—A Nutritious Legume.

"ANXIOUS READER" (Rockhampton)—

Your specimens have been determined as follows:—

(1) *Cnicus lanceolatus,* Spear Thistle. This is common in Queensland, New South Wales, and Victoria, and is the thistle generally spoken of here as the Common Scotch Thistle. The true heraldic thistle, however, of Scotland is a slightly different plant. Stock, particularly horses, eat the seed heads very freely in spite of the prickly nature of the plant. Its room, however, is preferable to its company. The plant seems to come in cycles, sometimes overrunning a district and then more or less dying out. During the past season it seems to have been particularly abundant everywhere.

(2) *Phaseolus lathyroides.* You speak of this plant as somewhat like a sweet-pea in growth. The specific name, *lathyroides,* refers to the similarity. It was introduced into Queensland as a fodder some years ago, and since then has spread fairly widely in the State. It has been spoken very highly of as a stock food, but here it seems to be very variable in this respect. In some places stock eat it quite readily, hardly touching it in others. I have not heard a local name applied to it. It is a leguminous plant and quite nutritious.

Canada Fleabane.

D.P.K. (Kilcoy)—

The plant you forwarded under the name of Rag Weed is Canada Fleabane, *Erigeron canadensis.* Two species of *Erigeron* are very common in Queensland—namely, *Erigeron linifolius*, a very tall, coarse-growing one, a common weed on scrub farms, particularly in banana plantations; the other is a greener plant, a common weed of cultivation, but extending more into the general pasture. We quite agree with you that this plant reduces very considerably the carrying capacity of the pasture. Nevertheless, we have had reports from farmers and pastoralists stating that they are readily eaten by stock. Probably the animals are making the best of a bad job.

A Beneficial Plant (*Grewia polygama*).

INQUIRER (Melbourne)—

The specimen is *Grewia polygama*—the only knowledge we have about this plant is that it is very freely used in North Queensland as a remedy for diarrhœa and dysentery. The leaves are soaked in water overnight or maybe hot water is poured on them and the liquid allowed to become cold. It forms a somewhat mucilaginous liquid and is said to be very efficacious. We understand that in some parts of the North it is quite an article of trade, not only in North Queensland but in the Northern Territory and right over to the north-west of Western Australia.

Tree Tomato.

F.H. (Graceville)—

As far as can be told from the single leaf, the specimen is the Tree Tomato, *Cyphomandra betacea.* This plant belongs to the same family (Solanaceæ) as the tomato, but has a very different tasting fruit. They can be eaten either raw or stewed and have a peculiar flavour of their own not quite like anything else. Sometimes in excessively wet weather the plants lose their leaves, but often recover when the weather becomes drier. If you think your plant is dying and you wish to replace it, you can try taking off some of the young shoots at the top and putting them in as cuttings.

Leafy Panic Grass.

W.H. (Dagun, near Gympie)—

The grass is *Brachiaria foliosa*, the Leafy Panic Grass, a native grass and quite a good fodder for stock. It is sometimes found in the mixed native pasture, but on the whole rather prefers soil that has been broken or disturbed in some way, such as old cultivation paddocks, &c.

Carpet Grass—Crow Foot Grass.

L.R.B. (South Johnstone)—

(1) *Axanopus compressus*, the Broad-leaved Carpet Grass. This grass has gone under other names, such as *Paspalum compressum* and *Paspalum platycaule.* Two forms of it occur in Queensland, the narrow-leaved and the broad-leaved varieties respectively. We think the broad-leaved one is the better of the two, and is quite a suitable grass for tropical localities such as Innisfail. Of recent years this grass has come into Southern Queensland, and farmers are rather perturbed about its ingression into Paspalum pastures, as it has not the carrying capacity of the common Paspalum (*Paspalum dilitatum*). So far as our observations go, however, this latter species does not do well in really tropical localities such as Innisfail.

(2) *Eleusine indica*, Crow Foot Grass. This grass is very widely spread over the warmer regions of the world and is mostly found as a weed in cultivation, around back-yards, calf pens, &c., or in fact anywhere where the ground has been disturbed. It is not often found in the general pasture. Stock seem very fond of it, and, though we have had no losses from it in Queensland, it contains, like young Sorghum and some other plants, prussic-acid glucoside. Fed with caution, however, no trouble should be experienced from it.

SHEEP LAND FOR GRAZING SELECTION.

Oondooroo Resumption.

OONDOOROO resumption is situated on the Longreach-Winton Railway, in the Winton land agent's district, about ninety-five miles south-westerly from Hughenden, and embraces three portions with areas ranging from 24,000 acres to 26,000 acres. The portions will be opened for Grazing Homestead Selection at the Land Office, Winton, on Tuesday, 15th May.

The term of lease will be twenty-eight years, and the annual rental will be twopence half-penny per acre for the first seven years of the term.

The portions consist of good fattening and woolgrowing country, being principally open downs, with well-shaded channel country along the creeks and well-grassed with Mitchell, Flinders, and other grasses.

Water supplies consist of bores, equipped, with drains, tanks, and dams, and natural supplies in holes in creeks. Further supplies can be obtained by boring at a reasonable depth, and there are good sites for dams.

Other improvements consist of boundary and internal fencing, yards, and huts.

Each selection will require to be stocked to its reasonable carrying capacity with the applicant's own sheep within a period of three years, and proof must be furnished of the financial standing and pastoral or land experience of the applicants.

Free lithographs and full particulars may be obtained from the Land Agents at Winton and Longreach, the Land Settlement Inquiry Office, Brisbane, and the Government Intelligence and Tourist Bureaux, Sydney and Melbourne.

POINTS IN GRAZING LUCERNE.

The chief points to be observed in grazing sheep on lucerne, if the best results are looked for, are:—

Paddocks should be subdivided, so that the size of the paddock is in correct relation to the size of the farm flock.

Sheep should never be allowed to feed on lucerne when it is raining, or both sheep and lucerne are liable to suffer.

Hungry sheep should never be turned on to lucerne, particularly if the growth is sappy.

If sheep are grazed for any time on lucerne alone, a dry pick is essential for the best results. Stock occasionally show symptoms of lucerne sickness when kept on it continuously.

General Notes.

In Memoriam.

PATRICK JOSEPH KENNEDY.

It is with great regret that we record the death on 24th February of Mr. P. J. Kennedy, an officer of the Marketing Branch of the Department of Agriculture and Stock. The late Mr. Kennedy was born at Ipswich, Queensland, in 1872, and was the second son of Mr. and Mrs. Daniel Kennedy, old and well-known residents of the Moreton district. He was educated at the Christian Brothers College, Gregory terrace, Brisbane, and subsequently entered the public service. He enlisted for active service with Queensland Mounted Infantry in the South African War. At the end of that campaign, he returned to Queensland and engaged in business activities on his own account. Soon after the constitution of the Council of Agriculture he joined the staff of that organisation and became closely associated with Mr. L. R. MacGregor, then Director of the Council of Agriculture and now Commonwealth Trade Commissioner in Canada. He afterwards received an appointment in the Department of Agriculture and Stock, which he retained until the time of his death.

In his younger days, the late Mr. Kennedy was a keen sportsman and excelled as a rifle shot, being a member of the Lowood and Brisbane Rifle Clubs. He won many trophies for his skill as a marksman, and in 1910 represented the State in Commonwealth competitions. He was laid to rest at Lutwyche Cemetery on 26th February in the presence of a large gathering, including many who had been associated with him in official and commercial life. The late Mr. Kennedy is survived by his widow (formerly Miss Maud Muller, of Warwick, Queensland), two daughters, and five sons, to whom the deepest sympathy is extended.

Staff Changes and Appointments.

Mr. W. D. C. McNeill, Inspector in Charge, Helidon and Crow's Nest Tick Cleansing Area, and Mr. D. Hardy, Inspector of Stock, have been appointed District Inspectors of Stock, Department of Agriculture and Stock.

Mr. E. A. Green, Inspector under the Diseases in Plants Acts at Wallangarra, has been appointed also an Inspector under the Apiaries Act.

Constables C. C. Francis (Mount Perry) and C. Zillmann (Bundaberg) have been appointed also Inspectors under the Slaughtering Act.

Constable H. P. Gerber, of Chillagoe, has been appointed an Inspector of Slaughter-houses at that centre.

The following persons have been appointed Honorary Rangers under and for the purposes of the Animals and Birds Acts as from the 10th March:—Mr. A. Marshall (manager, Malvern Downs Station, Capella), Messrs. M. A. Martin and B. Anderson (Bundaberg), Messrs. B. R. Beirne, H. A. Muller, and C. O. Sharp (Toowoomba), Mr. F. H. Barlow (City Engineer, Toowoomba), and Aldermen J. Robinson, J. Platz, and F. B. Common (City Council, Toowoomba).

The resignation of Mr. J. C. Wilson as an Agent under the Banana Industry Protection Act at Wamuran has been accepted as from the 10th March.

Open Season for Game.

The Minister for Agriculture and Stock, Mr. Frank W. Bulcock, in announcing the issue of an Order in Council providing for an alteration in the dates for the open season for duck and quail in Southern Queensland for a period of five months from the 14th April, pointed out that the protective period of seven months prescribed in the previous Order in Council extended from the 1st October in each year to the 30th April in the following year, inclusive.

Acting on information supplied from authoritative sources, it was decided that this period might operate somewhat earlier than usual, in view of the fact that ducks and quail were fairly plentiful, especially on the Darling Downs.

Mr. Bulcock emphasised the fact that, although an alteration had been made in the date for the opening of the season, there was no intention to reduce the period of seven months' annual protection, which would apply as hitherto, and would be strictly enforced.

Citrus Levy Regulation.

A Regulation has received Executive approval empowering the Committee of Direction of Fruit Marketing to make a levy on all citrus fruits marketed for the year ending 28th February, 1935.

The levy is at the same rate as that of last year, namely, 5s. per ton on fruit sold for factory purposes, 3s. 2d. per ton on fruit forwarded by rail for other than factory purposes, and one penny per case on fruit forwarded otherwise than by rail for other than factory purposes. The levy may be collected by agents or persons who hold to the credit of growers money on account of citrus sales, or, in some cases, by the Commissioner for Railways, and the method of collection shall be by means of levy stamps obtainable from the C.O.D., which shall be affixed to account sales or credit notes. In the case of citrus fruits sold privately, the grower shall furnish a return of such sales to the C.O.D., and pay the levy due. Carriers of citrus fruits shall furnish a monthly return to the C.O.D. of all fruit carried for market.

The sums raised by the levy shall be expended in the interests of the citrus industry.

Proposed Plywood and Veneer Board.

Following on the presentation to the Government of a petition by producers of plywood and veneer requesting that all plywood and veneer produced in that portion of Queensland south of the 23rd degree of south latitude be declared commodities under "The Primary Producers' Organisation and Marketing Acts, 1926 to 1932," and that a Board be constituted in relation thereto, a notice of intention to make an Order in Council to give effect to the above request has been issued.

A petition for a poll to decide whether this order should be made must be signed by 25 per cent. of the growers of plywood and veneer, and must be lodged by the 23rd April next.

The proposed Board shall be a marketing board and shall consist of ten elected representatives of the growers and the Director of Marketing and an Officer of the Forestry Department. The Board shall be constituted for one year, and growers of the commodities shall be those persons who own plywood and veneer plant, and have produced plywood and veneer for sale. Upon making the order, the commodities shall be vested in the Board as the owners thereof.

The Minister is empowered to appoint an Officer of the Forestry Department to be an additional member of the Board.

Provision will be made in the order that the Plywood and Veneer Board shall have authority to acquire and allocate raw material (including timber) required by producers, and shall receive and allocate to the producers, on a quota basis, as decided by the Board, all orders for the supply of plywood and veneer, and shall control the marketing thereof.

The Board shall also control the appointment and registration of agents in Queensland, the Commonwealth, and in other countries, and shall determine the remuneration of such agents.

Nominations will be received at the Department of Agriculture and Stock, until 23rd April next, for the election of ten growers' representatives on the proposed Plywood and Veneer Board. Each nomination is to be signed by at least five growers of plywood and veneer.

Sugar Cane Prices Boards.

An Order in Council has been issued under the Regulation of Sugar Cane Prices Acts removing all members of Local Sugar Cane Prices Boards who were appointed for the currency of the 1933 crushing season.

The annual elections have now been completed. and the Governor in Council has to-day appointed the Millowners' and Canegrowers' Representatives on the various Local Boards, together with the Chairman of each Board, for the forthcoming season.

Protection of Wage Levels.

A league has been formed in London to urge upon the Government that each section of the Empire must recognise that it is its duty to protect its own wage level, to allow free competition on that level, but to demand an import duty equivalent to any difference between domestic and externally lower costs.

Protection of Native Flora.

For the purpose of effectively preventing the wanton destruction and removal of protected native plants throughout the State, the Department of Agriculture and Stock has sought the co-operation of the Main Roads Commission, and fifty-three officers of the Commission stationed throughout Queensland have been appointed Honorary Rangers under the Native Plants Protection Act.

Strawberry Culture.

March and April are the main planting months for strawberries in Queensland. A pamphlet containing instructions in strawberry culture is now available for distribution on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Canary Seed Board.

Nominations will be received by the Returning Officer, Department of Agriculture and Stock, Brisbane, until the 26th April, 1934, for election as Growers' Representatives on the Canary Seed Board for the period as from the 1st June, 1934, to the 31st May, 1935. Two such representatives are to be elected by canary seed growers, and each nomination is to be signed by at least five persons who have grown or have growing canary seed for sale between the 1st June, 1932, and the 31st May, 1934.

De-grading of Bananas.

The Minister for Agriculture and Stock (Hon. F. W. Bulcock, M.L.A.) stated recently that the Chairman of the Banana Industry Protection Board (Mr. H. Barnes) had reported to him that the Board was making inquiries into the reason for the big increase in the number of cases of bananas being de-graded in Melbourne.

The grades in both Victoria and New South Wales are similar to those in Queensland, and the Inspectors in all three States take the same measurements, i.e., from the outside of the curve from the end of the stalk to the butt at the flower end. There has always been a certain amount of marking down in Sydney and Melbourne, and it has been ascertained this is almost invariably due to the faulty or careless grading and packing by growers. As, however, defaulting growers are periodically advised of their errors, it is difficult to understand now why there should be such a big increase in the number of cases of fruit de-graded, instead of a gradual decrease.

Arrowroot Board.

The only nominations received at the Department of Agriculture and Stock, in connection with the election of five growers' representatives on the Arrowroot Board, were from the present members, namely:—

Carl Brumm (Woongoolba).

James Francis Cassidy (Woongoolba).

Alexander Rose (Norwell).

Robert Stewart (Ormeau).

George Rawlinson Walker (Upper Coomera).

These persons will be appointed for a further term of three years.

No Open Season for Opossums.

The Minister for Agriculture and Stock (Mr. Frank W. Bulcock) has called attention to certain unauthorised reports which have been circulated and which would indicate that a decision has been arrived at to declare an open season for opossums during the present year. Mr. Bulcock deprecated any action which might mislead trappers and others interested, and again emphasised the fact that no decision had been made on the matter by the Government.

It must be obvious to all persons interested in the opossum fur trade that oversea market conditions are a primary factor in any decision to open the season and for that reason close touch is kept with the London markets. It is noted that in the September and January sales there was a strong demand for skins of good quality, but those of inferior class were practically unsaleable. In any decision which will have a bearing on the opening of the season, the question of supply and demand must, in the interests of all concerned, and especially the trappers, be carefully studied as there would be no justification to decide in favour of an open season if supplies of suitable skins were not procurable or prices were offering which would not give the trapper at least a reasonable return for his labour and financial outlay.

Mr. Bulcock also drew attention to reports of illicit trapping and warned those who committed breaches of the law by trapping during the period of protection that every effort would be made to cope with these irregularities, and trappers in their own interests are advised that it would be unwise for them to take, what they might consider, a "sporting" risk in attempting to evade the provisions of protective legislation.

Citrus Crop Prospects.

The Minister for Agriculture and Stock (Mr. Frank W. Bulcock) stated recently that reports submitted to him by the Director of Fruit Culture (Mr. H. Barnes) on the prospects of the citrus crop in the various districts showed that the crop for the coming season promised to be an exceptionally good one. The previous forecast, earlier in the season, of a 50 per cent. increase would be fully realised in some districts. In the Gayndah district the crop was well forward and promised to be of good quality and size. The summer crop of lemons was now being marketed and satisfactory prices were being realised. In this district the industry was advancing on sound commercial lines, and growers were making negotiations for the establishment of a Co-operative Packing House, which would add to the good name the district had already built up as a producer of good-quality citrus fruits.

On the North Coast there was every promise of a big crop also. Mandarins were not in heavy bearing, as a severe drop was experienced when the fruit was setting, but nevertheless growers were looking forward to a good harvest. Although a number of new plantings had been made on the North Coast, the total acreage there was not increasing owing to the number of orchards which were yearly going out of production, due to unsuitable conditions.

The Tambourine Mountain district expected to market a record crop this year of excellent fruit. This district, during recent years, had increased its acreage very considerably, and, provided weather conditions were favourable during the blossoming period each year, could be looked to to produce in a few years a considerable percentage of the State's annual citrus yield.

Honey Board.

A vote on the question of the continuance of the Honey Board for a further term of five years was conducted at the Department of Agriculture and Stock to-day with the following results:—

	Votes.
For the Continuance of the Honey Pool	100
Against the Continuance of the Honey Pool	70

The election of members was also taken, and resulted as follows:—

	Votes.
Charles William Edwards (Greenbank, via Kingston) ..	228
Robert Victor Woodrow (Woodford)	196
Henry Edgar Fagg (South Killarney)	195
Owen Norman Tanner (Samford)	184
Roy John Bestmann (Caboolture)	100
Alfred Gambling (Raceview, Ipswich)	97

The first four-mentioned persons will therefore be elected for a term of two years as from the 9th March next.

The retiring members were Messrs. Edwards, Fagg, and Tanner. Mr. J. Schutt did not seek re-election.

Rural Topics.

Diseases of the Udder of Dairy Cows.

Since the udder secretes the milk which is the staple product of the dairy farm, its health is of prime importance to the farmer. Unfortunately it is liable to be affected, with a number of diseases, which may not only considerably lessen the milk production (sometimes permanently), but also may have serious effects on the general health of the animal. The more important diseases affecting the udder are infectious, but by careful attention to sanitary management they may be controlled to a large extent.

Inasmuch as milk forms a very important article of human diet, particularly for children, a considerable responsibility is thrown on the dairyman to supply only a pure, wholesome, disease free product.

Structure of the Udder.—The udder or mammary glands of the cow consist of two halves, separated along the middle line. Each of these halves is divided into two quarters. The halves are separated by a well-marked partition, but although the two quarters of each side do not communicate with each other, there is no visible division between them. The udder is covered with a soft pliant skin, upon which are fine soft hairs. Hair, however, is not usually present on the teats. The gland tissue itself is arranged in a great number of lobes which communicate with tiny tubes or ducts. These ducts run into larger vessels, and by these the milk secreted in the gland is conducted to a cavity known as the milk cistern, above the base of each teat. Each quarter has a teat through which the milk is drawn during milking. The teats are cylindrical in shape, soft, and elastic to the feel. Each contains a single passage or duct which opens above to the milk cistern and below to the tip of the teat.

The size and texture of the udder varies in different animals and different breeds. An udder which shrinks up after milking (milks out like a glove) is preferable to a large fleshy udder which does not shrink much in size when empty, and which denotes, usually, that the cow is not a great milk producer.

On handling the empty healthy udder the gland should be of the same consistence throughout. There will be a great variation in the actual "feel," depending upon the texture of the udder in the animal under examination, but the texture should be similar right through the organ; no lumps or thickenings should be detected.

Evidence of Udder Disease.—Different diseases affect the udder in different ways. Some affections may attack the skin mainly, others the gland tissue; some diseases make an acute attack on the gland and the symptoms appear suddenly, others are slow moving in their effect, the changes taking place being gradual. Some of the common changes which occur are:—

(1) The milk becomes watery or thickened, contains minute or larger clots, contains blood or becomes discoloured. It may have an unpleasant smell.

(2) Milk production may be more or less rapidly decreased, or cease altogether.

(3) The skin may show the presence of reddened, sore areas, scab formation, or small pustules.

(4) The udder may be hot, tense to the feel, and painful to handle.

(5) Hard lumps may form in the udder.

(6) The whole of the quarter may become uniformly hard.

(7) The quarter may "waste away" and become useless.

(8) Swellings may occur in front of or behind the udder.

(9) One quarter or more of the udder may die and slough off, leaving a gaping raw wound.

(10) In addition to any of the above, the animal may show signs of general disturbance of health, refusal of food, panting, shivering, and so on.

From the above it will be seen that, although in many cases the changes in the milk or the udder are obvious and cannot be mistaken, in others the changes are gradual and not likely to be detected unless sought for.—A. and P. Notes, New South Wales Department of Agriculture and Stock.

High Speed Porkers.

A leading firm of stock food manufacturers in the British Isles, in emphasising the value of their commercial pig foods, speaks of them as producing high speed porkers. They claim prime porkers reach 120 lb. live weight in twenty weeks, and high-grade baconers 200 lb. live weight in twenty-seven weeks or less. They emphasise, however, that such high speed results can only be maintained when the best materials are used in the most skilful manner and with stock that are well bred and of the best commercial type. The day of the mongrel pig has gone for ever. The only pigs that are profitable in these days are those that are well bred, well fed, and carefully managed. This emphasises the slogan—"Better Pigs for Every Farmer."

Pigs—Grain and Milk.

An overseas contemporary, in discussing the success of the Danish farmer, indicates that Denmark established her pig industry, not on co-operation as so many seem to think, but on her ability to change her agricultural policy to meet new conditions.

When the increased quantities of cheap grain began to arrive from the American and Canadian prairies, Danish farmers, as grain producers, were unable to meet the severe competition. In order to remedy the difficult situation they turned to technical improvement. The surplus export of grain was replaced by a rapidly growing export of animal products, such as butter, bacon, and eggs. The prosperity of Danish agriculture during the past fifty years was based on the Danish dairy industry, bacon production being subsidiary in that it afforded an opportunity of making full use of dairy by-products.

Cheap feeding stuffs would seem to be essential to the successful development of pig production. To be successful the pig must be fed on farm-grown grain, milk and other products, and of these foods, grain, milk, and root crops hold pride of place.—E. J. SHELTON, Senior Instructor in Pig Raising.

Watering of Cows.

Experimental investigations have proved very definitely the value of giving cows free access to water at all times. The U.S.A. Bureau of Dairy Industry investigated this matter in 1931. The tests were carried out in both warm and cold weather, and with high and low producing cows.

The effect on consumption of watering twice a day was compared with results obtained when the cows had free access to water. The cows drank 1.5 per cent. more water when watered twice a day than when allowed to drink at will, and 13.3 per cent. more than when watered only once a day. They produced most, however, when given free access to water, averaging 2.8 per cent. more milk and 2.1 per cent. more butter fat than when watered only twice a day. Twice-a day watering as compared with the practice of giving water only once a day gave, on the average, an increase of 1 per cent. more milk and 1.4 per cent. more butter fat. It was also found that the increase in milk production as a result of more frequent watering was more marked in the case of the good producers than in that of the low producers.

Benefits of Fallowing.

Twelve district societies organised competitions in the western wheat zone of New South Wales last season, and, notwithstanding the unfavourable conditions, the average of the yields of all competing crops was 29¾ bushels per acre—an excellent performance, comments the Chief Instructor of Agriculture, New South Wales, in his report as judge:—

"In such an adverse season as that experienced in the southern and western portions of this division, the production of yields of 24 bushels per acre may be regarded as an achievement, which was made possible by the practice of fallowing. This result should be sufficient to demonstrate that fallowing is the best insurance against drought, and should persuade wheatgrowers that it is essential to successful farming in these areas and encourage them to make it a general practice.

"In every instance the initial cultivation of the fallow was completed by August, and it may be of some significance that the crop produced on the fallow which was ploughed on the latest date exhibited the most evidence of distress in the final stages. The earlier the fallow is ploughed the longer is the land in a receptive condition to absorb any rains that may fall, and not only is there an increase in the amount of moisture conserved, but the other benefits of fallowing are increased, such as control of weeds and disease, the production of nitrates, and the preparation of a good seed bed."

Protein in the Ration—For Milk Production.

In his report on a competition recently conducted by Camden Haven branch of the Agricultural Bureau of New South Wales, the departmental dairy instructor who acted as judge emphasised the value of protein in the feeding of cows for production. The protein or nitrogenous portion of any fodder mixture, it was stated, was the most expensive one to provide, but it had been very truly said that the secret of milk production lay in the provision of a plentiful supply of protein. Common fodders rich in protein were lucerne, cowpeas, and vetches, and among the concentrated fodders, linseed meal.

"Balancing" a ration meant that the foods were to be mixed in such a way that all the constituents thereof could be most economically made use of by the cow. For instance, saccaline contained a large proportion of carbohydrates—sugar. If fed on a ration of saccaline only, the cow would use only such proportion of the carbohydrates as she required, and the remainder was wasted. To "balance" the carbohydrates, a fodder containing more protein should be mixed with the saccaline, and the quantity of the latter reduced. A suitable fodder would be lucerne hay. Substitutes, however, could be cowpeas, vetches, red and berseem clovers. A crop which was very high in protein and which had not been tried in New South Wales to any extent was the soy bean, a crop which was grown very extensively in the United States.

The cow's natural fodder, and one which naturally provided a balanced ration, was a mixture of grasses and clovers in bloom, and if this could be provided for her all the year round, it would be easily the most economical method of feeding. A start in the right direction was the provision on most of the farms of areas of winter grasses and clovers. If continued and extended into a number of small paddocks on each farm these would be of incalculable benefit in time to come, when it might be possible for paspalum and clover pastures to provide grazing in the summer, with rye and clover pastures for the winter, reserves in case of necessity being provided by the pit silo.

A Point in Pig-Feeding.

If the value of all the food wasted annually in pig feeding could be accurately estimated, observes a South African paper, it would certainly amount to a very considerable sum. That money would be much better in somebody's pocket than on the muck heap.

A certain amount of wasted food is inevitable, but a great deal of the waste that occurs might be prevented by a little foresight. Unsuitable troughs are, perhaps, the first and most frequent cause of wasted food. When pigs are fed with slop in troughs which have no rim, a certain amount of food is bound to be pushed overboard and lost.

Food is also wasted when the trough accommodation is not sufficient for the number of pigs, and again when there are no divisions, so that the pigs jostle one another or can run their noses along the bottom of the trough, as they often will. This habit is encouraged when food is mixed too thinly, for this induces the pigs to push to the bottom for the solid matter to be found there. That results in a good deal of the liquid being pushed over and any meal suspended in it is lost.

Cream Quality Affects Butter Quality.

The low prices at present being received by suppliers of cream may prove a temptation to some to be satisfied with a little less than the best possible in the way of quality of the product when it leaves the farm, observes the "Agricultural Gazette" of New South Wales. Producers should remember, however, that upon the quality of the cream supplied depends the quality of the butter that that factory can produce, and that any falling off in butter quality would have a serious effect upon prices, and upon the dairying industry.

Not only does a decrease in cream quality affect the reputation of the output of a factory, but it actually penalises the producers of really high quality choicest cream, by injuring the quality of the butter made from that cream when blended with a cream of lower quality. The larger the proportion of "bare choicest" cream that is used at a factory, the greater the danger of a falling off in the quality of the butter produced.

Though modern methods of manufacture may do a lot towards eliminating undesirable features in cream, the factory should only be called upon to deal with those faults which it is impossible for the producer to avoid.

Lucerne, a Hardy Crop.

The following interesting evidence of the persistency of lucerne under unfavourable conditions appears in a recent issue of the "Agricultural Gazette" of New South Wales:—

"By way of experiment the Department sowed an area of lucerne in 1925 on the property of Messrs. D. and J. Gagie, West Wyalong. The germination was poor, and although the stand was given no after-treatment by way of renovation or top-dressing, and has had to weather abnormally dry and wet seasons, and, furthermore, has at times been subjected to very harsh treatment by being heavily grazed when droughty conditions made other feed very scarce, it has proved to the Department's satisfaction that a lucerne stand will provide good grazing in the Wyalong district for as long as seven years. Given reasonable care and attention, the stand should remain in excellent order, and free of weeds for from eight to ten years.

The stand on Messrs. Gagie's farm was continuously stocked with horses throughout its whole life, except for the six months, May to October, 1926. The fact that any of the plants at all survived this treatment during the long dry spells is proof of the persistency of lucerne under adverse condition of climate and management. Not only did this stand have to survive droughty conditions, but during the first six months of 1931, when 21 inches of rain were recorded, it was under water no less than four times.

"The lucerne on Messrs. Gagie's farm was sown in September, 1925, at the rate of 7 to 8 lb. per acre. Later experience has shown that 4 to 5 lb. per acre sown in the autumn will result in a better stand."

Care of the Milking Herd.

Absolute cleanliness and care at all points are necessary for the ensurance of quality in milk and cream. Following are some important precautions in the care of the milking herd:—

Keep milkers away from weeds. Ordinary food flavours from such fodders as lucerne, silage, &c., can be removed by aeration and cooling of milk and cream on the farm, and pasteurisation at the factory; but strong food flavours or taints, such as from carrot weed, cannot be got rid of.

Clean, fresh, running water is best, and next to it comes good spring or well water pumped into troughs. Water contained in dams, marshes, or stagnant pools is bad, and is swarming with harmful germ life. Milking cows should be prevented from wading into such places, otherwise they bring the contamination into the milking-yard by the mud which clings to their skins. Those in this state should be brushed and wiped, and have their udders washed before milking. The same applies when they have to wade up to their bellies through muddy yards. If this is not done, the dust from the dried mud falls into the milk bucket, and the dirt on the udder and teats oozes through the milker's fingers and mixes with the milk, which then produces fermented and badly flavoured cream.

Milk should be well strained. A filter cloth fitted on top of the gauze of the strainer will greatly help in improving the milk. These cloths should be destroyed or thoroughly boiled for twenty minutes before being used again.

Give the cows high, clean, dry ground to camp on. The infections caught in low-lying, swampy ground and stagnant water cause most unclean flavours and smells in cream and butter, and they are also often responsible for fermented cream and sour milk.

In wet weather scrape the cows with an iron hoop before milking to prevent drips from falling into the bucket. Milk from sick or diseased cows should not be used for human consumption, or for making butter or cheese. The milk from injured teats should be thrown away.

Tribute to the Butter Board.

At the recent Rockhampton Ward Conference of the Queensland Producers' Association, it was moved by Mr. Harding, seconded by Mr. Legh: "That this conference of farmers notes with relief the enactment of the Commonwealth butter marketing legislation, which we consider to be the greatest achievement to date towards the objective of securing for dairymen a return for their services equivalent to that received by other sections of the community for their services; and we record our appreciation of and thanks for the work of our dairying leaders, particularly Mr. Chris. Sheehy (secretary of the Council of Agriculture) and Queensland Butter Board, who have been responsible for the success."

Points for the Inexperienced Poultry Raiser.

The Minister for Agriculture and Stock, Mr. Frank W. Bulcock, stated recently that he had had brought under his notice several cases of buyers of poultry having been duped, and for the benefit of the inexperienced poultry raiser, he had made the following statement:—

"On commercial poultry farms, cockerel chickens that are not required are selected at an early age, usually from four to six weeks, and sold in the auction market. The reason for the sale of the cockerel chickens at this age is due to the fact that most breeders are of the opinion that it would not be profitable to keep them any longer. It is becoming a practice of some dealers to buy these unwanted cockerels and advertise them for sale as purebred White Leghorn chickens, age four to eight weeks. This class of advertisement is misleading. Although the birds offered for sale are chickens, they are cockerel chickens. Inexperienced persons are induced to purchase as the result of this type of advertisement, thinking that they will obtain an equal number of females and males, and as the chickens are partially grown, consider that an added advantage."

Mr. Bulcock further mentioned that this class of chicken came direct from the brooder to the market, that they had not been weaned from the brooder and consequently were at a difficult stage to handle; moreover, that birds of this age would not travel as well as day-old chickens.

There was another type of deception practised on unsuspecting buyers, and that was the sale of culled and discarded hens. It was a common and necessary practice for poultry farmers to cull their flocks, due to the fact that birds become unprofitable as they age. These culls are sold in the market for table purposes, and it is not uncommon for these birds to be bought by dealers to meet the demand resulting from an advertisement. One dealer appeared to operate under more than one name, and had been known to state to a prospective client that he was selling the stock from his brother's farm in a certain locality. Upon investigation, no brother's farm could be traced, but it was ascertained that he had been a constant buyer of culled hens from one auction room.

The Minister considers that this class of business is distinctly undesirable, and warns prospective purchasers against buying so-called chickens on account of their sex and the unwanted hens of commercial poultry farms.

Grade Your Seed Wheat.

It is very important in the sowing of wheat that only graded seed be used. Grading not only removes wild oats and other foreign seeds, but also ensures uniformity. If the size of the seed is uneven the sowing will be uneven, inasmuch as the grain will not run evenly through the cups of the drill.

It must not be imagined that because small grains are sown, weak or poor plants will necessarily result. As a matter of fact, if the smallness of the grain is due to adverse weather conditions during growth, no harm is done—indeed, the crop may be a vigorous one. But if the smallness of the grain is due to the parent plant having been weak or diseased, it is obvious that a good strain cannot result. In order to be on the safe side, therefore, farmers should thoroughly grade their seed before sowing.

Various types of graders are on the market, but it will generally be found that the type equipped with the cylinder and perforated screens is the most efficient, and for all practical purposes the single-cylinder machine is the most convenient. For small quantities of up to, say, 250 or 300 bushels, a hand machine will answer the purpose admirably, but for larger quantities of wheat it is advisable to drive the grader with a small power engine.

Unless experimenting, the wheat-grower should sow only varieties which have proved the best yielders in his district.

Some varieties fulfil a dual purpose, and can be cut for hay or harvested for grain. On the other hand, farmers growing wheat for the chaff market must exercise particular care in choosing suitable hay varieties. Further, in growing for grain the difference between the yields of a suitable and unsuitable variety may be as much as a third of the yield.

In general, the best yielders are those that are able to make use of the full growing period in their respective districts—that is, those that can be sown seasonably.—A. and P. Notes, N.S.W. Department of Agriculture.

Feeding of Pigs.

Much better results would be obtained in pig-farming if closer attention were given to the important question of feeding. The many points which make for successful results must be carefully observed from the time that the pig is born to the time that it is marketed. Unfortunately many pig farmers appear to be under the impression that the pig will thrive under whatever conditions it may be fed and on food which may be actually unwholesome.

The foods available (and there is a considerable choice of pig foods in New South Wales) must be so used that the animal is supplied with adequate material for growth and early maturity. A properly balanced ration is necessary, by which is meant that the nutritive constituents are associated in such proportion as to produce the results sought in feeding with little or no waste. The feeds available on most farms are quite adequate, but the way in which the animals are fed is the cause of many losses of young pigs. Pigs require to be fed from clean vessels and from clean troughs, free from crevices. The trough should preferably be of concrete built into a concrete floor.

The pig is well adapted for the disposal of many waste foods of the household, farm, orchard, and dairy, but unless these foods are in a sound and wholesome condition serious troubles may be caused by their use, and the quality and market value of the carcase may suffer. Of all farm animals the pig responds most readily to generous feeding; the stomach is only small, but the intestines are of great length, indicating great digestive powers, and for these reasons the pig must be fed frequently and at regular intervals.

The value of grazing and pasture crops is becoming more recognised, and when their use is combined with the feeding of maize or other grains good results are obtained. Green feed regulates and tones up the digestive and circulatory systems and keeps the animal in a healthy condition. It has to be recognised, however, that green feed will not entirely replace grain. Skim milk and butter-milk are of great value as pig food, not only when fed by themselves, but more particularly when combined with maize, as they greatly increase the digestibility of the latter and effect a saving of grain. Favourable climatic conditions, plenty of good, clean water, good grazing land, and association with dairying on a small scale are factors in the cheap production of pork.

It is necessary, if the best price is to be obtained, that the pigs should be of the correct type, well fed and topped off before being sent to the market, and the growing conditions should be so arranged that they develop and arrive at the desired weights in a specified time. A system of grading should always be in operation on the pig farm, each grade being kept in its own yard or small paddock. Unless such a system is followed the large pigs do not give the smaller ones a chance, the result being that the latter take longer to get into market condition, with consequent loss to the producer.—A. and P. Notes, N.S.W. Department of Agriculture.

Soil Erosion—Value of Contour Drains.

"Although hill land on the far South Coast (N.S.W.) was not flooded by the recent deluge, in many instances it suffered greater damage than did alluvial land—and damage that, unfortunately, is irreparable," writes an officer of the Department of Agriculture in the current "Agricultural Gazette" of New South Wales. "On nearly every farm, paddocks are to be seen that have suffered 'gullying' and 'sheet erosion,' one being as bad as the other, although the damage resulting from the latter is not nearly as evident as that from the former.

"A striking example of the value of contour furrowing for the prevention of this erosion is to be seen on the farm of Mr. C. N. Squire, at Springvale. On this farm, as hilly as any other in the district, the damage by washing from the rains was practically nil, the reason being that Mr. Squire having realised the value of contour furrowing his country, had carried it out on all his cultivations, and he has now reaped the reward. With all the rain, these single furrows, placed about ½ to 1 chain apart depending on the slope of the land, carried all the water across the paddocks, and did not allow it to go its own course and cause scouring.

"The farmers of the Bega district should make an effort to visit this farm and see for themselves how this recently-introduced method of preventing soil erosion stood up to this severe test. Mr. Squire is every ready to explain the whole operation, from the construction of the home-made level to the completion of the single furrows that do the job. If contour furrowing will stand up to 13 inches of continuous rain, it will stand up to any weather likely to be experienced in this district."

Holding Power of Fruit Case Nails.

One of the problems which confront the users of softwood fruit cases is the tendency of the nails to withdraw from the wood if the case is subjected to rough handling in transit to market. To overcome this rusted nails are often used, while there are on the market special nails claimed to have holding power, such as barbed or jagged nails, twisted or spiral nails, cement coated and sand rumbled nails, and these are used to a considerable extent.

In order to determine the relative efficiencies of the various types of nails available, the Division of Forest Products of the Commonwealth Council for Scientific and Industrial Research recently carried out a comprehensive series of tests. Samples were obtained from the principal nail manufacturers of the Commonwealth, the size of the nail being standardised at 2¼ inches by 12 gauge; and Western Hemlock, by far the most commonly used timber for softwood containers in Australia, was used for the test.

The results (published by Ian Langlands in Technical Paper XI. of the Division) showed that the rusted nail had the highest static (gradually and steadily applied load) holding power, while twisted nails had the highest impact (load applied suddenly) holding power.

Combined composite figures (a straight average of the static and impact figures), considered to be the best expression of the all-round efficiency of the various types of nails, were also calculated, and these showed the twisted wire nail made from square wire to be superior to all others, next in order being the rusted nail and the twisted nails made from grooved wire. With the exception of cement-coated twisted nails, and a certain type of barbed and cement-coated barbed nail, the other types showed no significant improvement over the plain nail.

Lucerne for Grazing.

Some years ago the idea existed that lucerne would only grow satisfactorily on deep, rich, alluvial flats, but to-day it is considered to be one of our best and hardiest pasture plants for cold, as well as dry localities. The advantages of lucerne as a pasture are:—

1. It gives good grazing most of the year and produces rapid growing and very fattening feed.

2. It provides fresh green feed at most periods.

3. It can be stocked heavily with the knowledge that with a spell of a week or two, fresh green feed will again be available.

4. It provides excellent pasture on which to wean lambs or lamb down ewes.

5. Paddocks of lucerne can be kept free of "seedy" grasses.

Not only does lucerne provide succulent feed during most seasons in average years, but, once established, it will supply good picking in droughty periods, responding more rapidly than most pasture plants to even light falls of rain. Its value, either when sown alone for grazing purposes or in a pasture mixture, is rapidly becoming recognised, and it is safe to predict that larger areas will be sown each succeeding year.

Where conditions are favourable, early autumn sowing is recommended, at the rate of 2 lb. to 4 lb. per acre if sown alone, and 1 lb. to 2 lb. if sown as part of a pasture mixture.

Lucerne should not be heavily stocked the first season of its growth, as the plants are not then sufficiently strong to withstand the inevitable trampling. Again, it will not stand continual grazing at any time; and the method should be to put sufficient stock on to eat it down quickly, and then to move them off before the young plants have commenced to shoot. The paddock should be subdivided into small lots for grazing, so that the stock can be moved from one to the other in quick succession. Temporary fences could be erected and moved as required. Rapid feeding off prevents injury to the plants and reduces loss and excessive fouling of the feed.

Top-dressing with 1 to 1½ cwt. of superphosphate per acre should be carried out at least every second year. Apply the fertiliser in August, working it in with a spring-tooth or rigid tine cultivator.—A. and P. Notes, N.S.W. Department of Agriculture.

Clean Paddocks—How to Deal with Weeds.

The need for the freedom of paddocks from weeds of all kinds and the value of bare fallowing for the improvement of crops have again been emphasised by the Director of Agriculture (Mr. A. E. Gibson).

Mr. Gibson states that agriculture in Queensland has arrived at a stage where, in very many instances, more up-to-date and scientific methods must be applied. The pioneers who cultivated virgin areas of land received as their recompense crops that were both of good quality and heavy in yield. With the changed conditions, and because also of the low prices given for commodities, areas which in the earlier days gave comparatively good returns to the growers are now failing to give yields commensurate with those of the past, and, often, by no means satisfactory.

In addition to that many of the areas are weed infested, and Mr. Gibson says that the farmer who expects to get a return at all proportionate to the amount of work and capital involved must now give his attention urgently to the question whether his methods should not be amended and improved.

In the opinion of the Director, the first consideration is, perhaps, the cleanliness of the paddocks—that is, their freedom from weeds of all kinds. These can be eradicated only by cultivation; sometimes, by the use of grazing animals, and it is advocated that where it is possible to turn weeds into money by this means, that should be done. In this way the weeds are not only checked, but a valuable fertilizing influence is obtained from the grazing of the cattle.

Bare fallowing, Mr. Gibson also explains, is one of the greatest aids to weed eradication, and although farmers complain that they cannot afford to have paddocks lying idle through a full season, when those paddocks are cultivated at, or before, the beginning of the rainy season, they must consider whether it is a payable proposition to get the paddocks cleaned up and thus improve their subsequent crops, or whether they will continue to apply the same slovenly methods—methods which, so often, have ruled for several past decades.

Assuming that the grower has cleaned up his paddocks by the means suggested, it is, of course, a vital essential that only seed which is known to be free from all foreign seed should be sown. Mr. Gibson is emphatic on the point that the expenditure of a shilling or two more per bushel, when graded seed is in the balance, is money well spent. Clean paddocks are thus additionally assured.

Where wild oats are a pronounced difficulty it is possible that bare fallowing will not, in one season, secure the desired result, but the continuance of the fallowing, or the growing of a crop which requires inter row cultivation, will go far in removing any volunteer growths of this character that remain.

Mr. Gibson says that the loss to Queensland wheatgrowers alone by the inclusion of wild oats, if it could be stated in figures, would be a staggering revelation to those producers who consider that wild oats can easily be cleaned from the resultant grain. They forget that buyers take the presence of the oats into consideration when fixing values, and therefore allow a lesser price for the wheat.

Canary seed growers are deeply interested in the question of clean areas, as they know from experience that the cleaning of the seed, which is forwarded to the Canary Seed Board, is, in 98 per cent., if not in 100 per cent., of the cases, absolutely necessary before it can be classed as a merchantable article complying with the requirements of the Pure Seed Act. Here again farmers incur an overhead cost which can be largely reduced, and, the Director adds in conclusion: "It is to the attention of these growers that these comments are chiefly directed."

Butter Board Commended.

At the annual meeting of the South Burnett Co-operative Dairy Association at Murgon, the chairman, Mr. S. A. Heading, speaking on price stabilisation and an Australian price, said (vide "The South Burnett Times"):—"There is no question about it, Queensland leaders in the industry have done wonderful work in bringing about this position. Had it not been for Queensland leaders, it would not have come about. Mr. Chris. Sheehy has done wonderful work and has been responsible in a great measure for the formulation of the scheme. He moved a vote of thanks and congratulation to the Butter Board and Mr. Sheehy; they certainly deserved commendation." Mr. Mallon seconded the motion, which was carried unanimously.

Forage Poisoning—Care Necessary in Humid Weather.

Quite recently serious mortality from "botulism" or forage poisoning occurred among horses in the south-western district. Forage poisoning may be defined as a disease caused by eating foodstuffs which have become poisonous (toxic) through the growth in the fodder of a particular microbe, *Bacillus botulinus*. Horses are most commonly attacked, because of all classes of stock they are most commonly fed on prepared fodder, though cases in cattle are by no means uncommon, and even sheep and pigs may be affected at times.

This microbe is what is known as a saprophyte; that is, a microbe which may be found in soil, dust, or water, and ordinarily lives therein, gaining its nutriment from dead (decomposing) vegetable material. Being in the soil, the microbe easily gains access to such fodders as hay, chaff, and silage, per medium of the dust raised from the surface soil. It then requires suitable conditions of moisture and warmth in order to multiply, being in this matter much like a seed. This microbe is, of course, microscopic, and even when multiplying in fodder does not produce any recognisable changes.

Conditions which favour its growth also favour the growth of other micro-organisms, particularly moulds, and thus we frequently find it growing in mouldy fodder. Fodder which is simply mouldy, however, does not induce the disease we call forage poisoning, unless this particular microbe has been growing in and has produced its characteristic poison in such fodder.

An acute type of the disease follows where a large quantity of poison (toxin) has been absorbed. Characteristically its onset is sudden and its course rapid. Careful observation will reveal listlessness, slight inco-ordination in gait, and clumsiness in eating. Then follow the typical symptoms of "paralysis" of the tongue, and the muscles which perform the act of swallowing, salivation being marked at this stage. Following this paralysis the animal loses co-ordination of the limbs, and usually soon goes down. This may, in fact, on account of the non-observation of earlier symptoms, be the first thing noticed in very acute forms of the disease. There are no manifestations of pain, but the animal struggles ineffectively to regain its feet. Affected animals may lie on the ground for one to three or four days, depending upon the amount of toxin that has been absorbed. Finally, however, death supervenes, the animal being conscious almost to the end.

In the chronic form, termed "sleepy staggers," the animal is able to swallow small quantities of food provided it is moist, but has great difficulty in swallowing dry food. Mastication is extremely slow, and a proportion of the food drops from the mouth. Animals suffering from this form may live for weeks and gradually waste away, the abdomen assuming a pronounced "tucked-up" appearance.

This is another of those diseases in which the old adage, "prevention is better than cure," holds good. At the present time there is no method that can be relied upon for the successful treatment of affected animals, and stockowners should, therefore, keep the following points in mind when feeding:—

Foodstuff in which the microbe is found is usually mouldy.

Warm summer or autumn rains falling on fodder, followed by warm weather, may be responsible for the growth of the poison-producing microbe.

Of the several foodstuffs, that most prone to mould, e.g., silage, should be carefully guarded from the conditions which favour mould growth. Mouldy silage should not be fed on account of this risk, though not all mouldy silage is poisonous.

Should such damaged fodder overlie sound fodder, any toxin produced in the damaged fodder is liable to be washed through to the sound portion by rain.

Since there is not any means of determining which fodders are and which are not poisonous, one should, as far as possible, see (*a*) that only sound fodder is fed; (*b*) that where fodder is badly damaged, such damaged portions are burnt; and (*c*) that in order to minimise loss of fodder, proper care is taken in the protection of stacks, &c., from the effects of wet weather, and also the attacks by mice, since these are also likely to result in the growth of the microbe.—A. and P. Notes, N.S.W. Dept. Agric.

The Most Important Labour of Man.

Let us never forget that the cultivation of the earth is the most important labour of man. Unstable is the future of that country which has lost its taste for agriculture. If there is one lesson in history which is unmistakable, it is that national strength lies very near the soil.—DANIEL WEBSTER.

Progress in the Dawson and Callide Valleys.

"Agricultural development in particular, both in the Dawson Valley and Callide Valley Areas, has made very noticeable progress since my last visit to those parts of the State in 1930," said Mr. T. L. Williams, M.L.A., on his return from a recent visit to those areas and the Upper Burnett, in company with the Minister for Lands (Hon. P. Pease), who was paying his first official visit to those districts.

Particularly did this apply to the Theodore Irrigation Settlement Area, added Mr. Williams, where the majority of settlers were a happy and contented lot, and were gradually overcoming the initial difficulties that had been brought under his notice from time to time, when, on previous visits to the settlement in a journalistic capacity. The variety of crops being grown had extended, and, though the great problem of finding suitable and adequate near-by markets for the products grown had not been entirely solved, many individual settlers—the more self-reliant and progressive in spirit and methods, in particular—were in a position to place most of the output from their holdings, chiefly in Northern and Western centres, at prices showing reasonable profits, despite the generally low prices maintaining from time to time for the products grown—tomatoes, onions, pumpkins, eggs, chaff, and fodders, &c. Methods adopted in farming also showed a decided all-round improvement.

Dairying all along the Dawson Valley and Callide Valley branch lines had made wonderful strides during the past few years, he continued, and already the Wowan branch factory of the Port Curtis Co-operative Dairy Association, Limited, had well over 600 direct district suppliers, and a turnover of approximately 100 tons of butter a month at present. So great, in fact, has been the progress in the dairying industry in the Callide Valley Area alone, that a strong movement is afoot to secure the erection of a further branch factory of the company at some central point along the Callide Valley branch line, to meet the convenience of settlers engaged in dairying pursuits in that area alone.

Cotton was still one of the main crops grown, however, for which, of course, the district soils are so eminently suited in every way. In the Theodore Irrigation Settlement Area, almost every settler engages in the growing of cotton to a greater or lesser extent (both in the irrigable and the non irrigable sections). The total area under that particular crop this season is estimated at approximately 1,500 acres, and in most instances, on present appearances, a record crop is anticipated.

Throughout the entire length of the two valleys in question, the total area under cotton this year will run into many thousands of acres, and as the season has been the most favourable for a number of years past, growers are confident of a record yield in most instances. Plants are flowering well and bolling freely, although in a number of places visited by the party rain was badly needed to promote and develop the young bolls. Shedding of the top squares, owing to lack of rain at the right moment, was noticeable in several parts of both districts, but given rain within the next week or two, further shedding of the middle and lower squaring systems would be arrested, and good general yields result, despite present unfavourable seasonable conditions referred to in the localities affected.

Feeding of Brood Sows.

At no season of the year is the feeding of the brood sows as important as it is during the humid weather of wet seasons and during the summer and early autumn months when weather conditions are usually unfavourable for taking necessary exercise, and when there is a tendency for the animals to seek a cool spot and spend most of the time lying about. Such a tendency is exaggerated when the animals are overfat and heavily fed, and especially when the food is of a heavy bulky nature. For best results brood sows should be kept in medium breeding condition, and especially at the time the sow is mated it is important that she be not overfat. The use of properly balanced rations is important, and the sow should be kept in good healthy condition by the free use of succulent green food and by being compelled to do a certain amount of foraging for her own living. Sows need plenty of clean drinking water, some mineral matters like burned corn cores, burnt or charred bones, a lump of rock salt to lick and regular and sufficient meals. It is better to have sows in medium breeding condition, for overfat sows are invariably clumsy and inactive at farrowing time and they rarely make a good job of suckling their young pigs. It is important that the food be appetising and succulent in order that the digestive tract be maintained in healthy condition, for constipation and other disorders of the bowels are disastrous and are responsible for loss of many valuable animals each year. If the sows are worth keeping at all they are worth caring for properly, and no effort should be spared to give them all the attention possible.

The Home and the Garden.

OUR BABIES.

(Issued by the Queensland Baby Clinics.)

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

A TRAVELLING padre in Central Australia has recently published two interesting books of his experiences in his vast but scantily populated parish. These are full of true yarns showing him to be an acute but sympathetic observer of human nature, with a strong sense of humour. One of them deserves quotation.

THE BABY AND THE COCKATOO.

The boarding-house was presided over by a young woman lately come from one of the big cities, and she had ideas of her own, which were not in accordance with the ways of the bush. She was an excellent cook and a good housekeeper, but her ignorance of many important things was abysmal. What she lacked in knowledge she made up in self-satisfied assurance. Consequently few offered her advice.

This young married woman had a baby. The baby had a small undernourished body and a loud and continuous wail. There was also a cockatoo, which, getting such frequent lessons, learnt to imitate the baby's wail to perfection: so much so, that when the baby and bird were at opposite ends of the house, and the mother in between, she was quite unable to distinguish between the infant and the bird. This, to say the least of it, was distracting, and caused her much unnecessary running about.

At last in desperation the mother took the baby across to Granny McGill.

Oh, Granny! I don't know what's the matter with the baby. I'm afraid she's fearfully ill. She cries and cries and nothing will pacify her. I'm sure she's sick.

Sick! Fiddlesticks, woman! replied Granny, tartly; all that's wrong is that you're ignorant and the baby's hungry.

But she can't be, Granny. I feed her regularly.

H'm! sniffed Granny. What do you give it?

Why, I give her a teaspoonful of condensed milk in a cup of warm water three times a day.

The old lady stared at the mother unbelievingly. A teaspoonful of condensed milk three times————. She broke off in disgust. Here give me the child. I'll teach you how to feed it, and muttering something about ignorant fools having the care of babies, set about preparing an adequate meal for the child. Half an hour later, while the contented babe slept peacefully on her ample lap, Granny gave the younger woman some plainly expressed advice.

The chastened mother took the sleeping baby and went home, and it became noticeable that as the cockatoo dropt the wailing for want of an example, the young woman became less opinionated and sought advice when she needed it.

We do not think the baby, who was being slowly starved, appreciated the humour of the situation. Lest some of our readers may draw a wrong conclusion, we must warn them that more babies cry from overfeeding than from underfeeding. These are not being starved, but are in constant torment from overloaded stomach and bowels. Being stronger than the starved babies, they cry much more loudly, and their mothers always think they are not getting enough.

This capable young woman from the big city had received a good State education. There must be something wrong with an education that turns out young women so unfitted for life.

RHUBARB PROPAGATION.

RHUBARB can be reproduced from seed or by subdividing the old plants. There are certain advantages to be gained from both methods, writes a departmental instructor in vegetable growing in the New South Wales "Agricultural Gazette." rhubarb is open pollinated, and unless care is taken in plant selection, a good deal of cross pollination takes place. Commercial seed is usually mixed in character, with the result that the commercial stalks are not uniform. It has been found, however, that rhubarb usually gives much quicker and heavier yields when grown from seed. On the other hand, if the crop is reproduced from a subdivided crown, a crop uniform in character will be produced, and this type of reproduction is less laborious and more reliable than the seed method.

Being a heavy feeding crop, rhubarb demands an abundance of readily available plant food and soil moisture. The crop does best in a free-working alluvial loam, which is well drained. Commercial growers obtain excellent results by digging into the soil up to 100 tons per acre of organic manure, and later force feeding the crop with artificial fertilisers. Although trials have not been carried out with rhubarb, the indications are that a mixture of blood and bone two parts, superphosphate two parts, and sulphate of ammonia one part, at 10 cwt. per acre, would be the best fertilizer mixture to use. When the crop starts to "pull," the quality of the following stalks can be improved by top-dressing with liquid organic manure.

In the intense culture areas around Sydney, the most successful growers produce rhubarb by the seed method. Their practice is to force the growth, "pull" heavily and destroy the crop at the end of the season. When grown on a wider scale the "split" crown system of propagating is used. The crop is forced, "pulled" heavily for a period, but allowed to develop mature leaves in order to allow the crown to recover for the development of workable stalks at a later date.

The marketing of rhubarb calls for a good deal of attention to detail if the best prices are to be obtained. In the first place, leaves which are damaged and turning brown, or those with split stems, should be discarded. The stalks should be sorted into various grades, according to their length, colour, and diameter. The best prices are always realised for large thick stems of a red colour.

The method of marketing is to pack the stems into bundles, which are rectangular in cross sections; these are made by packing in a small frame 5 inches wide. It will often be found that some of the best stems are bent and cannot be packed when fresh. Experienced growers usually allow these bent stalks to remain in the sun until they become supple, and, after packing, the stems are placed in water, where they quickly regain their crispness and freshness.

The best varieties are Ruby Red, Emu Plains Red, and Tops Winter.

A UTILITY GARDEN.

Possibilities of Establishment in Dry Districts.

In choosing as the subject of his paper the establishing of utility gardens in dry districts, said Mr. W. A. Ellis, at a meeting of the Euratha branch of the New South Wales Agricultural Bureau, he had had in mind the importance of vegetables in the diet and the difficulty in obtaining supplies. Food for the body, however, was not man's only need, and no such garden could be regarded as complete without flowers.

"Too many of us are inclined to think in terms of wheat and wheat only," observed the speaker. "Take a journey by road from here in any direction you please, keep your eyes open and notice the homes you pass. You will find in a few instances a well-kept garden, flowers blooming, a plentiful supply of fresh vegetables, and the refreshing green of fruit trees and shelter belts. In a few cases the owner has become discouraged for some reason or other, and there is just the shadow of what might have been a decent garden. But in far too many instances you will see a house dumped in a bare paddock; no attempt has been made to grow a few flowers or vegetables, and there is not a living tree in sight.

"There is no excuse, however. We have the soil, which is capable of growing almost anything. Stable manure is available in tons, when it is not allowed to blow away. Water is rather a difficult problem, but one which can be overcome. The only other requirements are a little energy and foresight on the part of the farmer and his family."

Orchard Notes for May.

THE COASTAL DISTRICTS.

IN these notes for the past two months the attention of citrus-growers has been called to the extreme importance of their taking every possible care in gathering, handling, packing, and marketing, as the heavy losses that frequently occur in Southern shipments can only be prevented by so treating the fruit that it is not bruised or otherwise injured. It has been pointed out that no citrus fruit in which the skin is perfect and free from injury of any kind can become speckled or blue-mouldy, as the fungus causing the trouble cannot obtain an entry into any fruit in which the skin is intact. Growers are, therefore, again warned of the risk they run by sending blemished fruit South, and are urged to exercise the greatest care in the handling of their fruit. No sounder advice has been given in these notes than that dealing with the gathering, handling, grading, packing, and marketing, not only of citrus, but of all other classes of fruit.

It is equally as important to know how to dispose of fruit to the best advantage as it is to know how to grow it. To say the least, it is very bad business to go to the expense of planting and caring for an orchard until it becomes productive and then neglect to take the necessary care in the marketing of the resultant crop. Main crop lemons should be cut and cured now, instead of being allowed to remain on the tree to develop thick skins and coarseness. As soon as the fruit shows the first signs of colour or is large enough to cure down to about from 2¼ to 2½ inches in diameter, it should be picked, care being taken to handle it very gently, as the secret of successfully curing and keeping this fruit is to see that the skin is not injured in the slightest, as even very slight injuries induce decay or specking. All citrus fruits must be sweated for at least seven days before being sent to the Southern States, as this permits of the majority of specky or fly-infested fruits being rejected. Citrus trees may be planted during this month, provided the land has been properly prepared and is in a fit state to receive them; if not, it is better to delay the planting till the land is right.

In planting, always see that the ground immediately below the base of the tree is well broken up, so that the main roots can penetrate deeply into the soil and not run on the surface. If this is done and the trees are planted so that the roots are given a downward tendency, and all roots tending to grow on or near the surface are removed, the tree will have a much better hold of the soil and, owing to the absence of purely surface roots, the land can be kept well and deeply cultivated, and be thus able to retain an adequate supply of moisture in dry periods. Do not forget to prune well back when planting, or to cut away all broken roots.

All orchards, pineapple and banana plantations should be kept clean and free from all weed growth, and the soil should be well worked so as to retain moisture.

Custard apples will be coming forward in quantity, and the greatest care should be taken to see that they are properly graded and packed for the Southern markets, only one layer of one-sized fruit being packed in the special cases provided for this fruit—cases which permit of the packing of fruit ranging from 4 to 6 in. diameter in a single layer.

Slowly acting manures—such as meatworks manure—may be applied to orchards and vineyards during the month; and lime can be applied where necessary. Land intended for planting with pineapples or bananas during the coming spring can be got ready now, as, in the case of pineapples, it is a good plan to allow the land to lie fallow and sweeten for some time before planting; and, in the case of bananas, scrub fallen now gets a good chance of drying thoroughly before it is fired in spring, a good burn being thus secured.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

CLEAN up all orchards and vineyards, destroy all weeds and rubbish likely to harbour fruit pests of any kind, and keep the surface of the soil well stirred, so as to give birds and predaceous insects every chance to destroy any fruit fly pupæ which may be harbouring in the soil. If this is done, many pests that would otherwise find shelter and thus be able to live through the winter will be exposed to both natural enemies and cold.

Further, it is a good plan to clean up the land before pruning takes place, as, if delayed till the pruning has been finished, the land is apt to dry out.

Pruning can be started on such varieties as have shed their leaves towards the end of the month, as it is a good plan to get this work through as early in the season as possible, instead of putting it off until spring. Early-pruned trees develop their buds better than those pruned late in the season. These remarks refer to trees—*not*

vines, as the later vines are pruned in the season the better in the Granite Belt district, as late-pruned vines stand a better chance to escape injury by late spring frosts.

All worthless, badly diseased, or worn-out trees that are no longer profitable, and which are not worth working over, should be taken out now and burnt, as they are only a menace and a harbour for pests.

Land intended for planting should be got ready as soon as possible, as, if ploughed up roughly and allowed to remain exposed to the winter frosts, it will become sweetened and the trees planted in it will come away much better than if set out in raw land. In any case the land must be properly prepared, for once the trees are planted it is a difficult matter to get the whole of the land as well worked as is possible prior to planting.

Slowly acting manure—such as ground island phosphates or basic phosphates—may be applied to orchards and vineyards. They are not easily washed out of the soil, and will become slowly available and thus ready for use of the trees or vines during their spring growth. Lime may also be applied where necessary.

This is a good time to attend to any drains—surface, cut-off, or underground. The two former should be cleaned out, and in the case of the latter all outlets should be examined to see that they are quite clear and that there is a good getaway for the drainage water. New drains may also be put in where required.

In the warmer parts citrus fruits will be ready for marketing, and lemons ready for cutting and curing. The same advice that has been given with respect to coast-grown fruit applies equally to that grown inland; and growers will find that careful handling of the fruit will pay them well. Lemons grown inland are, as a rule, of superior quality to those grown on the coast, but are apt to become too large if left too long on the trees, so it is advisable to cut and cure them as soon as they are ready. If this is done and they are properly handled, they may be kept for months, and will be equal to any that are imported.

If the weather is very dry, citrus trees may require an irrigation, but, unless the trees are showing signs of distress, it is better to depend on the cultivation of the soil to retain the necessary moisture, as the application of water now is apt to cause the fruit to become soft and puffy, so that it will not keep or carry well.

Land intended for new orchards should be got ready at once, as it is advisable to plant fairly early in the season in order that the trees may become established before the weather again becomes hot and dry. If the ground is dry at the time of planting, set the trees in the usual manner and cover the roots with a little soil; then give them a good soaking; and, when the water has soaked into the soil, fill the hole with dry soil. This is much better than surface watering.

Farm Notes for May.

FIELD.—May is usually a busy month with the farmer—more particularly the wheatgrower, with whom the final preparation of his land prior to sowing is the one important operation. Late-maturing varieties should be in the ground by the middle of the month at the latest.

Clover land, intended primarily for feeding off, should be sown not later than the end of April.

The necessity of pickling all wheat intended for sowing purposes is again emphasised; and for general purposes, combined with economy in cost of material, the bluestone and lime solution holds its own. To those who desire an easier but somewhat more costly method of treatment, carbonate of copper at the rate of 1 oz. to the bushel and used in a dry form is suggested.

Potatoes, which in many districts are still somewhat backward, should have by this time received their final cultivation and hilling-up.

The sowing of prairie grass on scrub areas may be continued, but should be finished this month. This is an excellent winter grass, and does well in many parts of Southern Queensland.

Root crops, sowings of which were made during April, should now receive special attention in the matter of thinning out and keeping the soil surface well tilled to prevent undue evaporation of moisture.

Every effort should be made to secure sufficient supplies of fodder for stock during the winter, conserved either in the form of silage or hay.

Cotton crops are now fast approaching the final stages of harvesting. All consignments to the ginnery should be legibly branded with the owner's initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus the address labels.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF FEBRUARY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING FEBRUARY, 1934, AND 1933, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.	No. of Years' Records.	Feb., 1934.	Feb., 1933.
North Coast.	In.		In.	In.
Atherton	10 35	33	18 80	19 22
Cairns	15 58	52	22 75	32 75
Cardwell	16 79	62	12 96	17 74
Cooktown	13 63	58	21 42	28·60
Herberton	7·74	48	19 07	13 27
Ingham	16 02	42	16 69	18 17
Innisfail	22 36	53	28 45	41 68
Mossman Mill ..	17 46	21	33 95	26 46
Townsville	11·11	63	14 19	10 03
Central Coast.				
Ayr	8 86	47	12 57	7 89
Bowen	8·65	63	12 69	9 67
Charters Towers ..	4 40	52	7 02	6 34
Mackay	11 39	63	11 76	19 86
Proserpine	11 93	31	14 22	12 68
St. Lawrence ..	7 79	63	11 76	1 86
South Coast.				
Biggenden	4 33	35	11 29	1 85
Bundaberg	6 40	51	19 26	4 90
Brisbane	6 41	83	16 16	2 44
Caboolture	7 74	47	16 95	3 62
Childers	6 55	39	21 54	4 15
Crohamhurst.. ..	12 95	41	18 11	4 08
Esk	5 52	47	8 96	3 93
Gayndah	4 21	63	8 58	1 71
Gympie	6 66	64	18 83	3 35
Kilkivan	4 88	55	12 91	1 39
Maryborough ..	6 65	63	21 16	5 38
Nambour	9 60	38	15 62	4 65
Nanango	4 12	52	5 45	2 44
Rockhampton ..	7·68	63	16 27	1 67
Woodford	8 50	47	13 21	3 70

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.	No. of Years' Records.	Feb., 1934.	Feb., 1933.
Central Highlands.	In.		In.	In.
Clermont	4 24	63	6 13	3 84
Gindie	2 72	35	0	0 58
Springsure	3 92	65	3 56	0·79
Darling Downs.				
Dalby	2 86	64	4 42	2 96
Emu Vale	2 56	38	2 46	1 52
Hermitage	2 50	28	0	2 13
Jimbour	2 64	46	4 48	2 59
Miles	2 71	49	4 82	1 88
Stanthorpe	3 21	61	2 53	1 40
Toowoomba ..	4 50	62	10 88	2 58
Warwick	3 08	69	3 35	2 02
Maranoa.				
Roma	2 93	60	3 60	0 98
State Farms, &c.				
Bungeworgorai ..	2 15	20	3 62	0 83
Gatton College ..	3 45	35	0	2 89
Kairi	9 76	20	14 51	17 73
Mackay Sugar Experiment Station	10 39	37	9 28	20 92

GEORGE G. BOND, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—FEBRUARY, 1934.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal	In	Deg.		Deg.		Deg		Points.	
Cooktown	29 80	86	74	94	5	70	5	2,142	25
Herberton	.	77	64	86	5	60	5, 6	1,907	21
Rockhampton . ..	29 91	87	71	97	4	66	21	1 627	10
Brisbane	29·97	83	67	93	4	62	10	1,616	10
Darling Downs.									
Dalby	29·94	85	63	92	15, 25	55	8	442	8
Stanthorpe	..	78	57	85	15	48	4	253	9
Toowoomba	..	77	61	85	15, 4	52	4	1,088	9
Mid-interior.									
Georgetown	29·82	89	71	96	8	66	1, 2, 3	1,172	14
Longreach	29 85	94	69	105	6	64	21	190	5
Mitchell	29·91	89	64	97	16	54	5	311	7
Western.									
Burketown	29·80	89	75	101	5	67	2	314	11
Boulia	29·81	96	74	105	8	67	20	732	3
Thargomindah	29·85	96	72	104	25, 28	63	10	63	6

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	April, 1934.		May, 1934.		MOONRISE. April, 1934.	MOONRISE. May, 1934.
	Rises.	Sets.	Rises	Sets.	Rises.	Rises.
					p.m.	p.m.
1	6·2	5·50	6·19	5·19	6·17	6·27
2	6 3	5·49	6·20	5·18	6·55	7·27
3	6·3	5·48	6·20	5·18	7·41	8·31
4	6·4	5·47	6 21	5·17	8·35	9·37
5	6·4	5·46	6·21	5·17	9·35	10·44
6	6 5	5 45	6·22	5·16	10·39	11·48
7	6·6	5·43	6 22	5·16	11·45	a.m.
8	6 6	5 42	6 23	5·15	..	12·54
					a.m.	
9	6 7	5 41	6 23	5·14	12 53	1 57
10	6 8	5·40	6 24	5·13	1·57	2 56
11	6 8	5 38	6·24	5·13	3·1	3·55
12	6 9	5 37	6·25	5·12	4 4	4·53
13	6 9	5 36	6·25	5·11	5 4	5 55
14	6 10	5·35	6 26	5·11	6 3	6·55
15	6·10	5·34	6·26	5·10	7·3	7·51
16	6·11	5·33	6 27	5·9	8 6	8·45
17	6 11	5·32	6 28	5 9	9·5	9·36
18	6 12	5·31	6·28	5·8	10·1	10·23
19	6 12	5·30	6·29	5·8	10 53	11·3
20	6 13	5·29	6 29	5 8	11·43	11·37
					p.m.	p.m.
21	6·13	5·28	6·30	5·7	12·28	12·9
22	6·14	5·27	6·30	5 7	1·6	12·39
23	6·14	5 27	6·31	5·7	1·39	1·7
24	6 15	5·26	6·32	5 6	2 11	1·37
25	6·15	5·25	6·32	5 6	2·40	2·10
26	6·16	5 25	6 33	5 5	3·10	2·44
27	6·16	5·24	6 34	5 5	3·41	3·24
28	6·17	5·24	6 34	5 4	4·14	4·12
29	6 17	5 23	6 35	5 4	4·51	5 10
30	6 18	5 22	6 35	5·3	5·35	6·14
31	..	..	6 36	5·2	..	7·23

Phases of the Moon, Occultations, &c.

7 April	☽ Last Quarter	10 48 a.m.
14 ,,	● New Moon	9 57 a.m.
22 ,,	☾ First Quarter	7 20 a.m.
29 ,,	○ Full Moon	10 45 p.m.

Perigee, 7th April, at 9.12 p.m.
Apogee, 21st April, at 11.42 p.m.

Mercury will be at its greatest elongation, 28 degrees west, on 2nd April

Saturn will be in conjunction with the Moon on the 10th at 6 a m., an hour earlier the Moon will be about its own diameter west of Saturn; both will be near the border of Capricornus and Aquarius and about half-way to the meridian. The more brilliant planet Venus will be visible in the coming daylight about 7 degrees further east and will be occulted by the Moon about 4 hours after both have gone over the western horizon.

As Mars will be in conjunction with the Sun on the 14th it may be said to have left the evening sky during this month.

On the 16th Venus will be at its greatest elongation, 46 degrees west of the Sun, and will be more than half-way to the meridian at Sunrise.

The conjunction of Jupiter with the Moon, on the 28th, will occur at midday when both are high up (two hours west of the meridian)

Mercury rises at 3 56 a m and sets at 4 36 p m on 1st April; on the 15th it rises at 2.40 a.m. and sets at 3.20 p m

Venus rises at 2 37 a m. and sets at 3 21 p.m. on the 1st; on the 15th it rises at 2 40 a.m. and sets at 3 20 p m.

Mars will set 11 minutes after the Sun on the 1st, with the Sun on the 14th, and one minute after it on the 15th

Jupiter rises at 6.15 p m. and sets at 6.47 a.m on the 1st; on the 15th it rises at 5.14 p.m. and sets at 5.44 a.m.

Saturn rises at 2.31 a m and sets at 3.41 p.m on the 1st; on the 15th it rises at 1.41 a.m. and sets at 6 51 p.m

Jupiter, which will be in opposition to the Sun on the 8th, will rise as the Sun sets and set as the Sun rises, if we ignore the more exact changes per second which will take place every moment, owing to the velocity, 8.1 miles per second of Jupiter and 18 5 miles per second of the Earth.

Mercury's path will be in Aquarius and Pisces; that of Venus from the border of Aquarius to the border of Pisces; Mars from Pisces into Aries; Jupiter will continue retrograde motion in Virgo, away from Spica; Saturn in Aquarius from Right Ascension 21·49 to R.A. 21·58.

6 May.	☽ Last Quarter	4 41 p.m.
13 ,,	● New Moon	10 30 p.m.
22 ,,	☾ First Quarter	1 20 a.m.
29 ,,	○ Full Moon	7 41 a.m.

Apogee, 19th May, at 5.54 a.m.
Perigee, 31st May, at 5.12 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.

Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling.** Members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.

QUEENSLAND AGRICULTURAL JOURNAL

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Event and Comment.

Anzac.

ANZAC DAY remains one of our most inspiring anniversaries, and even after the lapse of less than a score of years the Epic of Gallipoli has already become a great and glowing tradition of our race. In our observance of Anzac Day, which this year as in previous years was Australia-wide, one senses the vital element that keeps Australia true, not only to herself but also true to the traditions of the British peoples from whom we are proud to claim descent. Anzac Day will continue to hold its place in history. We have come to regard it not only as a day of reverent memory of the poignant tragedies of war, but a day on which our sense of spiritual values is strengthened by a contemplation of the invincible valour, the service, and the sacrifice of the men who set out on a great adventure and did not come home. Theirs was a venture of courage, and their courage never failed; theirs was a venture of faith, and their faith remains undimmed—an inspiration, surely, for us to face the perplexing problems of the present with something of the same strong faith and courage.

The spirit of Anzac is, after all, only an expression of the spirit of the pioneers of this country. That spirit is equally our inheritance to-day. So while honouring the men who gave their all for Australia in the war with deep reverence and respect, let us not forget that Australia calls to-day just as insistently for service as she did in 1914—a service we cannot deny her, a service that certainly was not denied her by her youth of yester-year who died in her defence.

Problems of Rural Development.

DEPARTMENTAL reports are usually regarded as dry and uninspiring documents, yet, rightly read, there is a wealth of interesting matter, even romance, in these reports that have so much to record of the building-up of a rural civilisation in Queensland. Reports, say, of the Department of Agriculture and Stock, of the Department of Public Instruction, and of the Main Roads Commission—to mention only a few—are all worth reading. The Annual Report of the Department of Agriculture and Stock deals with real problems of rural development. It shows that both primary and secondary industries are interwoven and inter-related to such an extent that it is scarcely possible to disengage them. And this fact shows the necessity of our determining and maintaining a balance between them if the country generally is to prosper. There is, however, a difference between the agricultural and manufacturing industries as they are now developed, particularly in regard to proper price relationship in respect of one commodity and another. Manufacturers can restore or adjust matters affecting prices and other economic factors by modernising their methods, reducing costs, discharging labour, introducing new machinery, and changing their product; or even getting out into other fields which can be done, not easily, certainly, but with comparative facility. In agriculture, on the other hand—with its numerous scattered units, its unrelated establishments, its small proportion of outside labour, its relatively large fixed capital, its slow turnover, its combination of business and industry with home and social life, its lack of flexibility in organisation, the perishability of its products, its dependence on the weather, and time as an irreducible factor—adjustment is slow and difficult. Since the manufacturer can reckon on a fairly quick adjustment of production to demand, he can, when prices drop, cut his costs with some confidence that in that way he will find, at least, temporary economic salvation. The farmer cannot do that to any appreciable extent. As an individual he has very little chance of cutting his costs, except by increasing production. He may, of course, cut out waste in production; but agricultural production is fundamentally a biological, not a mechanical, process which requires a fixed period of time; so that costs can be reduced only by increasing production in this period, and not by reducing the time required for the crop. Then, if the farmer increases production per acre of a commodity for which there is already a glutted market, prices will probably fall still further. Any plan for improving the conditions of our country life must, therefore, be considered in the light of these fundamental facts, in the light of the essential differences, notwithstanding their economic relationship, between urban and rural industries. The first is governed by fixed principles of mechanism and organisation, while agriculture is controlled entirely by natural conditions, seasonal circumstances, and so forth. So we come to this point: If we are to improve agriculture we have to get right down to business. With any increase in production must go extension of markets and the improvement in marketing facilities, transport, and so on.

And then we come to the question of farm efficiency. In manufacturing the inefficient producer generally goes to the wall unless his business is bottle-fed, or his commercial life is artificially prolonged by outside assistance—and probably at the expense of some other industry or organisation. In agriculture the inefficient producer may still, like

a poddy calf, remain on the bucket indefinitely, to the general detriment of the industry. All this is merely suggestive of the problems of building up our rural civilisation through agriculture, which are discussed, in one form or another, every year in the Agricultural Report.

Home Project Clubs.

COMING now to the work of the Department of Public Instruction, there is nothing in its last report more impressive than the section on Home Project Clubs, unless it be that descriptive of the success of the Correspondence Courses, whereby modern education is brought to the loneliest youngster in the remotest part of the State. That great service has certainly become one of the most important factors in the building up of a rural civilisation in Queensland. To quote from the report directly—

> The School and Home Project movement is one of the few departmental activities which, during this time of restricted funds and consequent non-expansion, it has yet been possible for the department to continue to develop. The growth of this movement is at once a tribute to and the result of teachers' and parents' appreciation of the educational and economic values claimed for the Project scheme at the time of its introduction and since. In country districts and even in urban schools it is becoming more and more realised that no school activity provides a richer field for responsible exercise in honest thinking and judgment-formation than does agriculture worked and studied on the Project plan.
>
> For the most part, teachers and clubs select projects which are agricultural in nature; yet, agricultural though the project is, the fact that the agricultural product is relatively unimportant, while the child—the member—is all-important, is becoming more and more appreciated by teachers; inherent educational values are becoming more and more recognised. Though the immediate purpose of club work is educational, teachers are still conscious that the children of to-day are the responsible citizens of to-morrow, and that from an educated, observant, reasoning youth economic benefits will in due course come.

The Broad Highway.

THE Report of the Main Roads Commission is a survey of a year's achievements that leaves the impression that the Commission is one of the most important factors in our rural development. One of the most important aspects of the history of civilisation is the development of the road for, in a very real sense, "transportation is civilisation." The literature of the road is curiously scanty. It provides the commonest of metaphors, but is one of the rarest of subjects. Poetry, imaginative prose, religion itself, would lose much if they were deprived of such convenient symbols as the broad, high road, the narrow path, the beaten track, the accustomed way, and the slippery slide to perdition. Civilisation "begins with wandering trails in the dim mists of pre history"; its present stage is the construction of solid concrete or bitumen highways reserved for fast motor traffic; between the two lies the material history of mankind. As a factor in rural development of Queensland, the importance of a sound main road policy is thus obvious to all who care to give the subject a single thought.

Queensland Citrus Scale Insects and their Control.

By W. A. T. SUMMERVILLE, M.Sc., Assistant Entomologist.

THIS report is primarily the result of investigations carried out during the past three years. For several years prior to the commencement of active investigational work, however, extensive observations on citrus scale insects were made whilst research work on other pests of this plant was being prosecuted. The conclusions arrived at and here presented are therefore based on work carried on over a considerable number of years.

Commonly, the problem of scale insect control on citrus in this State is not a simple one, but is complicated by the frequent occurrence of mixed populations of the scales themselves and by the necessity of using artificial methods of control for other pests and diseases. In the present state of knowledge, when the treatment for a scale insect materially affects or is affected by the recommended method of control of several other pests and major diseases, it is the scale insect treatment which must be varied if at all possible. Thus it becomes necessary to take into account the influence of other operations on the scale insect position, and questions of compatability of sprays and following treatments must be considered.

Whilst the control of almost any pest is influenced by many factors not specifically assignable to the insect in its simple relationship to the host, with no other pest or group of pests to which citrus in Queensland is subject are these "outside" factors of such great direct importance. When the habits of a pest are known it is often possible to anticipate a position, and anticipation usually means that the solution of the problem is facilitated. It is advisable, therefore, that growers familiarise themselves with the habits of each of the important species under different conditions. To do this some knowledge of the biology of the insects is necessary, and for this reason the first section of this report is devoted to an account of the rudiments of their biology.

Many growers are content to know that good results may be obtained against a particular pest with a certain insecticide. Fortunately, however, an increasing number are realising the inadequacy of that amount of knowledge, and time of application is being recognised as an important factor in the successful control of many pests. Time of application can seldom be accurately stated in terms of a calendar, though some indication may be given in that way. This is particularly true of citrus insects in Queensland. Here commercial citrus-growing areas are scattered over an area of almost 200,000 square miles, and variations in climate, which are reflected in the development of the pests, are only to be expected. It is necessary, therefore, to refer to times of application of control measures as taking place at a certain stage in the life history of the insect. Growers accordingly will always need to carry out observations on certain details for themselves, and here again a knowledge of the habits and biology of the pest will be of

considerable benefit. It will be quickly found that by making observations and interpreting what is seen in terms of the information given below much better results will be obtained than by the most slavish adherence to any generalised recommendations.

THE BIOLOGY OF THE SCALE INSECTS.

The forms and appearances assumed by the different species vary enormously, and it would be very difficult to compile a short and simple description which would enable orchardists to recognise an insect from its external appearance as being a member of the group known as scale insects or Coccidæ. In fact, in making almost any generalised statement concerning these insects, variations and exceptions at once come to mind, and if only those exceptions which apply to the particular species known to feed on citrus in this State were to be included, a description would be necessarily long and rather involved. This account is accordingly intended merely to give orchardists the facts of outstanding importance and interest which will enable them to obtain a working understanding of the group.

Whilst no short account can be given, it may be said that the whole range of forms is so different from those of other insects that scale insects can usually be readily recognised as such, once one has become familiar with a few species.

The Scale Covering.

In the majority of cases there is little to suggest the insect nature of the pest. In many cases the insect itself is not seen from the outside, as the body is entirely hidden from view beneath a secretion exuded by the insect. This secretion often forms a scale-like covering, and it is from this structure that the vernacular name is derived. The scale secretion may be one of many forms; for example, in the female red scale, *Aonidiella aurantii* (Maskell), it is circular, almost flat, somewhat parchment-like in consistency, and almost transparent (Plate 122), whilst in the white wax scale, *Ceroplastes destructor* Newstead, the covering is a thick waxy substance, rather irregular, though fairly constant, in shape, and almost as high as long. The shape of the covering at times gives little clue to the shape of the insect beneath it, but in general the sizes are comparable. In addition to this scale covering the upper surface a second scale may be found on the under or ventral surface. This ventral scale is commonly thin and transparent and very easily ruptured.

Some species do not secrete a "scale" at all, but in so far as the female is concerned remain naked throughout life. These naked species are commonly referred to as "soft" or "unarmoured" scales (Plate 126) in contradistinction to the armoured species described above. In these soft scales the exposed surface or dorsal derm is usually much thickened and hardened. Even with these naked species the resemblance to other insects is often remote, but they may perhaps be likened somewhat to a small tick.

For the most part the scale insects remain practically stationary on the plant once they have settled down and commenced to feed, but some, particularly those belonging to the mealy bug group, move freely about their host plant.

Reproduction.

The adult females, according to the species, either produce eggs or give birth to living young. When eggs are produced these may be deposited loosely beneath the body of the mother, and in these cases the body may shrivel or shrink up against the upper or dorsal surface so that the eggs ultimately occupy almost the whole of the cavity formed by the upper surface and the plant surface or the ventral scale. Certain species deposit their eggs in specially produced structures, which are more or less bag-like and are termed ovisacs. These ovisacs (Plate 127, fig. 1) vary greatly in detailed structure, but in so far as the citrus scales which produce them are concerned may be described briefly as cottony or floury bags. It is characteristic of these insects that there is one continuous period of reproduction. This period may be protracted, but in all cases observed, once the continuity has been broken there is no resumption, and the old female invariably dies very soon after completion of this work.

The Young Scales.

When first emerged from the egg or mother the young of many species of scale insects are difficult to differentiate, and there is commonly no discernible differences between the two sexes. In general the young are minute soft-bodied creatures, very pale green, creamy yellow, or almost transparent in appearance, and are equipped with six comparatively well developed and conspicuous legs. The antennæ or feelers are also usually large compared with the size of the insect itself. In this stage the insects are well described by the vernacular name of "crawlers" (Plate 127, fig. 4). On emerging from beneath the covering provided by the mother, the young scatter to a greater or lesser degree according to species and circumstances. Some settle down almost at once, but others wander about for several days. When this wandering period is completed the insect has found a site at which to feed, and it settles down and becomes fixed to the plant, and, as has been said, for the most part the remainder of its life is spent in that place. This does not apply to the male, for with this sex, though the immature stages remain fixed, the adult is a free moving creature.

Moulting and Development.

With the armoured species, the secretion of the scale covering begins immediately feeding has commenced. The first covering protecting the young, however, may differ greatly in appearance and texture from the scale which appears later. From this time onwards the differences between species becomes more and more apparent. The insect grows by a series of moults, there apparently being two moults in the case of the females of every species. The moulted skins or exuviæ may be included in the covering, and in such cases can commonly be found at the anterior end, or towards the central point of circular species, of the scale as a conspicuously different area from the remainder of the covering. When incorporated in the covering in this way these cast skins are referred to as pellicles. After the second moult the sexes can be distinguished, and in many cases the males bear little or no resemblance to the females of the same species, even on external characters. Commonly, the male is considerably smaller than the female, and the scale covering may be quite different. In the case of the white louse scale, for example, the female has a drab, brown, somewhat mussel-shaped scale of rather leathery or thick parchment-like texture, while

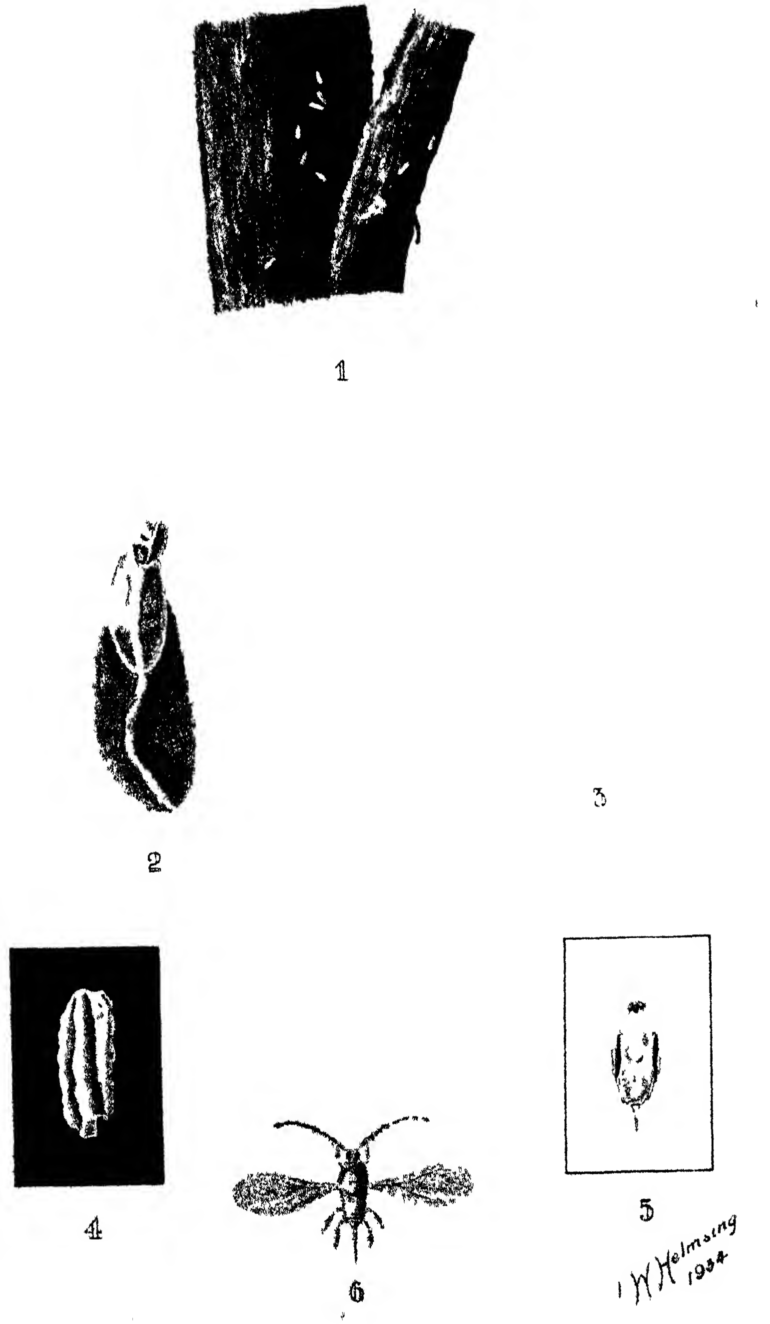

PLATE 121.

White Louse, *Chionaspis citri* Comstock. Fig. 1, Male tests on bark × 3. Fig. 2, Female test × 24. Fig. 3. Adult female × 24 Fig. 4, Male test × 24. Fig. 5, Male pupa × 24. Fig. 6, Adult male × 24.

the male scale is pure white, more or less cylindrical, deeply keeled and of somewhat cottony consistency. The differences in the insects themselves in all cases is even greater.

The Female Scale Insect.

The female (Plate 121, fig. 3) does not change very greatly in form during development, though usually it is more rounded in the later stages than when in the crawler form. The detailed structure may become much modified. The legs and antennæ may be lost or represented finally by minute stumps. In other species both legs and antennæ are retained throughout life, but even in such cases there is often some modification of the form of these organs.

The Male Scale Insect.

In the development of the male insect the changes are far more profound. In so far as those species which attack citrus are concerned, there are typically four moults in the development of the male insect. After the second moult the insect enters what is termed the prepupal stage. In this stage the characters are rather ill-defined unless viewed under high magnification, and can only be briefly described as indicative of those of the next or pupal stage. Even if the species be a naked one, at this time the males become enclosed in some form of investment comparable with the cocoon of a moth. Similarly the pupal stage (Plate 121, fig. 5) indicates the form of the adult in the same way as does the pupa or chrysalis of a moth. After the fourth moult the insect is perfect and ready to emerge. On emergence the adult male (Plate 121, fig. 6) is found to be greatly different from its female. The male has a fine narrow body, long and very fine antennæ, generally conspicuous eyes, and the whole appearance suggests fragility. Typically, the adult male possesses a single pair of fine delicate wings which carry a single forked vein. Probably the most striking character of the male scale insect is that it is without mouth parts, these having disappeared during development. The adult male is therefore unable to feed, and is thus very short-lived. The great majority of males die within a few hours of emergence, and probably none live much longer than twenty-four hours at the most. Adult males are rarely found in the orchard, and certainly no one but a student of the group would recognise these delicate winged creatures as the consorts of the fixed, sluggish, fat-looking female scale insects.

Parthenogenesis.

Many species of scale insects are able to reproduce without the presence of a male, and in the case of some well-known species the male has never been discovered. With certain species the female may reproduce either with or without the assistance of the male.

Rate of Multiplication.

That scale insects are so important as pests is due to a very large extent to the rapidity of their development, together with the large number of young produced by each female. In some cases individual females give rise to more than 2,000 eggs, and though natural mortality is certainly very high, in most cases the number surviving is commonly so great that huge populations are quickly built up from but a small number of original insects.

Manner of Feeding.

Scale insects possess rather complicated mouth parts, which, however, may be briefly described as long, slender, piercing, and tubular. The most conspicuous feature of these organs is their length, which at times is much greater than that of the entire body of the insect. The plant is pierced and the tube inserted into the internal tissues and the food sucked up in fluid form. The manner of feeding is essentially the same as that of the plant bugs. The actual injury done can best be considered in conjunction with each species in so far as citrus is concerned. The general direct effects of such a sap-sucking insect need no description. The indirect effects, however, are often just as important, and these, though readily to be expected, are often overlooked. The weakening of parts resulting in the entrance of other insects and fungal parasites is commonly a most important consideration. Unfortunately, it happens all too frequently that growers do not become concerned about a pest until or unless it is obviously a menace to the crop, but it must be remembered that anything which interferes with the vigour of any part of the tree affects the crop.

FACTORS INFLUENCING THE INCIDENCE OF CITRUS SCALE INSECTS.

Influencing the incidence of citrus scale insects are dispersion, climatic, locality, soil, and plant factors, and the various natural enemies. These will be discussed in turn.

Dispersion Factors.

As will be readily understood from what has been written concerning their biology, the scale insects are largely dependent on external factors for dispersal. The only form which possesses wings is the adult male, which is of little or no consequence in the matter, and, furthermore, the wings are so delicate that migration for any appreciable distance could only take place under most favourable circumstances. The females are, of course, the important factor. In the first stage for a time these are free-moving, but they soon become fixed to the plant and are removed only with difficulty and great probability of injury to vital organs, particularly the mouth parts. Species such as the mealy bugs, which habitually move about the plant for the greatest part of their life, may, however, be transferred from tree to tree at almost any time except, perhaps, during the reproductive period, but with the great majority of scale insects it is only in the first few days after emergence that dispersal is at all likely to take place. At this time the larvæ are able to crawl well, but they are so minute that the distance between two trees in an orchard or between a native host plant and an orchard tree is, comparatively speaking, very great, and the likelihood of such small, soft, and defenceless creatures safely reaching a destination five yards away is very remote. Furthermore, tests were carried out with a number of common species, and in each case it was found that when placed on soil under a tree the crawlers meandered about apparently without sense of direction. In almost every case, after hours of crawling, each individual ultimately arrived at a point within a few inches of the one at which it commenced. It is thus evident that, unaided, there will be little change of scale insects from tree to tree. Crawling is of some importance in the distribution of the pests on the tree on which the mother reproduced, and this method of dispersal is of moment in

another matter. In the case of some species, such as red scale, for instance, the females may continue to reproduce freely on fruit stored before marketing. The young of these females may be disseminated through many boxes of fruit in this manner. This point is of importance to lemon-growers, and also in connection with the importation of some species from one district or country to another.

The minute first-stage larvæ are easily dislodged from a leaf or twig when they are in the crawling stage, and are consequently carried away by air currents, and it is chiefly by this means that many species are distributed. Naturally, the degree to which the winds effect transportation depends to a certain extent on the length of time the young are crawling about the plant before attaching themselves securely to it. This is very well shown in the cases of pink wax and red scale. The latter is one of the quickest citrus scales in the matter of settling down, whilst pink wax commonly moves about freely for several days. Wind distribution of pink wax is much more efficient than with the red species, which is, in fact, but slowly scattered by this means. It will be seen then that the direction of prevailing winds becomes a consideration in dealing with some species of scale pests, and it will be understood that in carrying out control operations against species distributed to an appreciable extent in this way from outside sources it may be wise to commence operations on the leeward face of the orchard.

The minute crawlers are at times carried from one tree to another on hands, clothes, secateurs, and other such tools which come in contact with various trees in quick succession.

The introduction of scale insects from one district to another usually only concerns the grower in respect to bringing young trees on to his orchard. This has undoubtedly been the means of establishing certain species in some parts in the first place, and it is always wise to procure trees from the cleanest possible nursery apart from the fact that the infested young tree must be adversely affected by the presence of heavy scale infestation.

Climatic Factors.

Climatic conditions exert a very marked influence on both the incidence and development of every species of citrus scale insect. The optimum conditions for each species will be dealt with later in connection with the individual species. In so far as the present discussion is concerned, however, there is one point to be stressed. The majority of citrus scales in Queensland are present in every major commercial citrus district. In normal times certain of these species will be found to be of little or no importance in one particular locality. However, very quick response to climatic conditions is characteristic of practically every species, and thus in an abnormal season the position in any orchard may be fundamentally changed. It is therefore wise for an orchardist to become familiar with the essential points concerning each species encountered, even though certain ones may be considered of no importance to him at present.

Where it is the custom to draw up in advance a spraying programme for the year, as is often advisable, the possible variation of climatic conditions must be kept in mind. Far too often growers use a spray simply because they obtained good results with it at that time the previous year. It is surprising, too, how frequently growers will purchase large quantities of some material months in advance, only to find

subsequently that this material is not needed. Unfortunately, the rule in such cases appears to be to use the material on hand, even though it is going to give no benefit, and at the same time to neglect to obtain the correct spray. This is sometimes the result of lack of knowledge in the first place as to what spray is to be used in certain circumstances, but most commonly it is due to failure to recognise that seasons vary from time to time, and that climatic factors exercise great influence on many pests, particularly scale insects.

Locality Factors.

Factors in scale incidence which arise out of particular local conditions are, of course, in many cases more properly classified under other headings, particularly climatic conditions. However, it is necessary in this connection to point out that very local physical features at times exert considerable influence on atmospheric conditions. Protection afforded one orchard by a hill or a large belt of scrub or forest may decidedly affect the incidence of scale insects. The presence of a large area of an alternative host plant, such as often happens in the case of pink wax, may mean that one orchardist may need to adopt control measures different from those chosen by a fairly close neighbour. The influence of purely local factors is often ignored, particularly by small growers, who frequently too readily follow the lead of a neighbour merely because he has clean trees.

The position of trees is also of moment sometimes where the land slopes steeply. Thus trees high up the slope may differ from those lower down, the difference usually being confined to degree of infestation. Positional influence is sometimes bound up with soil factors or exposure to winds, and in such cases the difference may extend to species infesting the trees. The proximity of a windbreak, especially a natural windbreak in which there occurs an alternative host tree, and more particularly the proximity of another orchard, may be of moment.

Of interest, and at times importance too, is the position of the tree relative to a road or other such source of dust. The dust may collect on trees fringing a road, and by interfering with the functioning of the pores in the leaf and other parts become a factor in connection with scale insect incidence. It thus happens, particularly in the Maroochy district, that when an orchard borders a road the outside row of trees may become heavily infested with red scale, whereas this species is extremely rarely found further in the orchard. In the same way, on certain types of soil the lower limbs of trees may harbour larger populations of scale than those higher up, due to the accumulation of dust stirred up during cultivation. This has given rise to the idea that young scale are carried in dust, but this contention is erroneous.

Soil Factors.

From observations carried out over the last two years, it appears very possible that soil exerts some effect on the incidence of scale insects. Some very striking evidence has been collected, but the problem needs much more consideration before anything that is really definite can be given. However, it is of interest to note that in places trees on the same orchard growing on different types of soil carry different species of scales. Care has been taken to check the possible influence of other factors, and the final conclusion reached at times has been that soil variation has exerted considerable and limiting influence. This, of

course, is independent of the effective nutritional value properties of the particular soil—that is, the trees on both types have been in closely similar states of health and vigour.

The nutritional value of the soil is itself a most important factor, but the effect can best be considered in conjunction with plant factors. Apart from fertility, the moisture-holding capacity of a soil is important, and is at times a determining factor.

Plant Factors.

The state of health of a tree often determines the nature of the scale infestation it will carry. Thus an Emperor of Canton mandarin when in normal vigorous condition is very susceptible to infestation by pink wax. On unthrifty trees of this variety, however, pink wax may be of little or no importance, but mussel or red scale will then be commonly found to be present in large numbers. A healthy tree of this variety rarely carries appreciable infestations of either red or mussel except on the fruit under particular circumstances.

In the same way the health of any tree may be a determining factor in the matter of scale incidence—generally speaking, the more vigorous the tree the less scale it will carry. As the health of the tree is governed largely by soil conditions, presence of other pests, and diseases, all of these are of moment in the matter of scale incidence.

As might be expected, varietal susceptibility is also a consideration in this connection. At times, indeed, varietal characters are the determining ones, superseding even climatic influences. For example, it has been mentioned that the Emperor of Canton is very susceptible to pink wax. It will be found that trees of this variety growing in very dry parts where pink wax is ordinarily a rather rare insect may be heavily and habitually infested with this species.

Apart from influences which can be traced to specific causes, very often trees show individual characteristics with respect to scale insects the determining factors of which are not clear. Thus in one block of several hundred trees of one variety a small number scattered indiscriminately throughout the orchard may be persistently more heavily infested than the remainder, which may, in fact, be quite free of the scale. In some cases the trees may be obviously in different condition, a common cause being the bringing up of subsoil during preparation of the land, but in many cases there is no discernible difference between the attacked and free trees. It appears that the cause is to be found in the individual natures of the trees.

Natural Enemies.

The presence or absence of natural enemies of a species can greatly affect the success which it may meet in a particular locality or at a particular time, but as the effective enemies of the scale insects are well distributed throughout the country, it is seldom, if ever, that these natural enemies determine anything more than degree of infestation of a species. The only case in which incidence is likely to be affected is in the event of the arrival of a new species in a locality concurrently with the absence, or presence in overwhelming numbers, of natural enemies. Then, in the first eventuality, the new scale might become established with greater ease than would otherwise have been the case,

and in the second it might fail to gain hold in sufficient numbers to ensure continuation of infestation. As most of the natural enemies attack several species of citrus scales, this latter is possible, but it is nevertheless improbable and would almost certainly be of but a temporary nature. Natural enemies are of consequence in the matter of degree of infestation, and do not determine whether or no permanent infestation will actually occur.

THE ECONOMIC IMPORTANCE OF SCALE INSECTS AS PESTS OF CITRUS IN QUEENSLAND.

As a group the scale insects are the greatest limiting factor in the production of first-quality citrus fruit in Queensland, and that statement could probably be made of almost every country in the world. It is true that in almost every district in this State there is some pest or disease which causes growers more concern, at least over limited periods. Pests such as the bronze bug, *Rhœcocoris sulciventris* Stal., and the larger horned citrus bug, *Biprorulus bibax* Breddin, annually cause larger losses over restricted areas, and other pests such as the sucking moths may destroy larger quantities of fruit during limited periods in various districts, but the scale insects are of importance in practically every district at all times. There are fourteen species of scale insects found on citrus trees in Queensland, and of these all but five are of economic significance. Even with some of the five exceptions it would be unwise to assume that the economic status will always remain as it is now. Of the remaining nine species, seven are responsible for heavy losses in some parts every year, and apart from the status of the group, individual species are frequently the outstanding pests in particular parts. It is, however, as a group that these insects have to be considered. From what is recorded in connection with each species, it will be seen that there is scarcely a time or place that does not favour the development of some species of scale insect. Thus pink wax attacks vigorous trees, particularly in hot periods interrupted by good rains. Pulvinaria attacks vigorous trees, but is more in evidence in periods of rather milder temperatures, particularly in dry seasons. Red scale, on the other hand, thrives on weakened trees, particularly in the hot dry times, whilst should the trees be weak and the season one of high temperatures, together with fair humidity, mussel scale may be expected to make its presence felt. There is scarcely a commercial orchard in the State in which there are not several species of scale insects present, and, generally speaking, every tree harbours two or more. This, together with the breeding-grounds provided by trees outside the orchard in certain cases, ensures a nucleus from which an infestation may arise. Thus in almost any circumstances there is one species of scale which will menace the orchard. The insidious manner of working, together with the rapidity with which colonies increase, assists the species to take advantage quickly of suitable conditions and build up large populations before being detected, or at least before effective control measures can be taken.

Owing to the prolific and rapid reproduction of practically every species, the fight against scale insects is necessarily continuous, and in most of the major citrus-producing areas an orchardist who, by a single application of a scalicide, can keep his trees commercially free of these pests for more than one year is indeed fortunate, and, it may be added,

rare. In the case of at least one species—pink wax—even were elimination of all the individuals in an orchard possible at any one time, this would not ensure freedom from heavy attack for more than seven months at the longest.

That scale insects are so important as pests of citrus is due largely to the frequency with which remedial measures have to be applied, the destructiveness of many species, and the enormous numbers which are commonly present. This last factor is most important, for it means that to be at all efficient a scalicide must obtain a very high percentage kill to establish control lasting a reasonable period.

The status of each species will be considered in a later section in connection with the discussion on the habits of that species.

VERNACULAR AND SCIENTIFIC NAMES.

Naturally it is only by vernacular names that insect pests in general are known to orchardists. Whilst these suffice for most purposes, mistakes sometimes occur through unavoidable variation in these names in different parts of the State, and particularly in different countries. It very commonly happens that journals devoted to farming interests quote extracts on pests from overseas publications, and the rule in these cases is for such articles to refer to insects by vernacular names only. Costly errors have thus resulted in a number of cases, and as the practice is becoming more common, orchardists should be certain that they know exactly what insect is being discussed before making experiments, and the only way of doing this is by reference to the scientific name. Most Queensland citrus scale insects occur in other parts of the world, and many in every major citrus-producing country, and vernacular names not only differ in various countries, but the same or similar names are given to different species in different parts. The black scale of California, for example, is *Saissetia oleæ* (Bern.), which is Queensland's olive scale, whilst Queensland's only common black species, circular black, is *Chrysomphalus ficus* Ashm. In America this species, *C. ficus*, is called the Florida red scale, whilst Queensland's red scale is *Aonidiella aurantii*. The value of vernacular names is therefore obviously limited.

As regards the scientific names, these are unavoidably altered at times, and this may cause growers some confusion, especially when correlating information from books published at different times. Probably the outstanding case is with the old genus *Lecanium*. For many years a large number of the common Queensland scale insects were placed in this genus, and this is one of the few scientific names at all well known to citrus orchardists in this State. The subdivision of the *Lecanium* group into several smaller genera is thus unfortunate in some respects but must be accepted.

For the above reasons a brief account of the various important scientific names has been included, particularly those names which may be found in books readily accessible to orchardists. It may be helpful in this connection to note that in most cases it is only the generic name which has been changed. Thus the red scale has been generally known successively as *Aspidiotus aurantii*, *Chrysomphalus aurantii*, and *Aonidiella aurantii*, the specific name *aurantii* remaining constant.

Plate 122

Red Scale, *Aonidiella aurantii* (Maskell), showing infestation of fruit, foliage, and woody twigs.

RED SCALE.

The red scale, *Aonidiella aurantii* (Maskell), was first described by Maskell in 1878 from specimens taken from Australian citrus fruit imported into New Zealand. Maskell gave the insect the name *Aspidiotus aurantii.* The species was subsequently described under a number of other names, notably *A. coccineus* Gennadius, but the synonomy of these names was fairly quickly recognised. Later it was decided that the insect had been placed in the wrong genus, and experts for the most part were agreed that the correct genus was *Chrysomphalus,* and not *Aspidiotus.* More recently still the name has again been questioned, and from the most recent work it appears fairly certain that the correct naming is *Aonidiella aurantii.*

Description.

The pest (Plate 122) is common and generally well known to orchardists. The main characters by which it can be recognised by growers are as follow:—The scale of the female is circular with flattened margins and with the centre slightly raised. Owing to the fact that the scale itself is semi-transparent, the colour changes of the insect beneath affect the apparent colour, and though the actual colour of the scale is grey, it may appear grey, reddish-brown, or red. The scale is parchment-like in texture.

The young female is somewhat elongate and light yellow in colour, but later the extremity of the abdomen is modified in form, and the insect becomes sub-circular in outline. The colour generally becomes darker as the insect approaches maturity. The diameter of the female scale is approximately one-tenth of an inch.

The scale of the male resembles that of the female in texture and colour, though it is commonly lighter in shade in the case of the former. The male scale is elongate, and the convexity is found towards the anterior end instead of the centre as in the case of the female, the eccentric position being due to the addition of a "flap" at the posterior. In size the scale of a male pupa is scarcely half that of an adult female.

The adult male insect is light yellow in colour, with a conspicuous brownish band running transversally on the thorax. The remaining general characters conform to the description given in an earlier section for typical males.

Distribution and Habits.

The red scale is a notorious enemy of citrus in practically every country which produces that crop. It occurs throughout the tropics and subtropics, having been recorded from the United States of America, Southern Europe, Palestine, Egypt, South Africa, Ceylon, India, Japan, and China, as well as from many smaller countries. The original home of the insect is often given as Australia, but there is doubt on the point, and it is very possible that it is a native of the East.

The list of plants which the insect will attack is a long one, and includes apple, pear, banana, passion fruit, roses, and coconut palms. It is only as a citrus pest, however, that the species is of much moment. Though it attacks a number of indigenous Queensland plants, this is of little importance to citrus-growers, for the colonies in the forest and scrub are never an important source of infestation for citrus groves.

In Queensland the pest reaches its maximum intensity in the drier and hotter parts. In coastal districts south of Rockhampton, where the climate is more humid and the temperatures lower for the greater part of the year, red scale is not so severe a pest as it is in districts within the tropic or interior parts further south.

In every district this scale invariably becomes more important in abnormally dry periods than at other times. In these dry times there is always a very considerable increase in population, and the increase in damage is not due merely to the fact that the trees are then less able to withstand injury. The two factors certainly combine, and in such circumstances red scale commonly assumes the role of a major pest in areas where it is normally of little consequence. The increase in red scale populations in hot dry periods is sometimes attributed to a decline in the efficiency of natural enemies, particularly fungal parasites. All the evidence collected, however, shows that the increase is due mainly to the lower mortality rate of the young during such periods.

The state of the tree as regards health and vigour is also an important factor in determining the extent to which it will be attacked by this pest. Trees with impaired vigour are more susceptible to attack, not only in that they suffer more quickly, but in that they carry larger populations of the pest. The Emperor of Canton variety of mandarin is one which when healthy is rarely attacked to any extent by red scale, the pest in most instances, if present at all, being confined to immature fruit. When, however, it loses much vigour from disease or other cause an infestation of red scale frequently quickly follows. It appears that vigorous trees with a free flow of sap offer marked resistance to the pest, and, further, that on any tree the pest is less liable to become established on free-growing parts than elsewhere, for when trees of supple habit of growth are attacked, it is usual to find the insect confined, at least in the first instance and smaller infestations, to the more woody or weaker parts, where there is no great flush of sap.

Varietal susceptibility is in conformity with what might be expected from the foregoing. Thus lemons, which are more woody, are almost invariably infested, whilst the supple-growing mandarins are usually only troubled when other factors are operating strongly. Even in some very dry parts remote from the coast where the rainfall is very low, and where the available water cannot be used for irrigation, healthy mandarin trees quite free of red scale adjoin lemon trees which are persistently and heavily infested. Also in some of the wetter coastal districts small areas of lemons are sometimes included in an orchard, and though the red scale may be of no significance on the remainder of the trees, artificial control measures have to be applied against the red scale on the lemons. Most varieties of orange may be placed between lemons and mandarins in respect to habit of growth and also to the probability of attack by the red scale, and the placement is roughly quantitative.

The foregoing remarks apply essentially to well-grown trees. With young trees every variety appears to be very susceptible to this pest, particularly trees recently planted out from the nursery.

Red scale will infest all aerial portions of a citrus tree. When the foliage is heavy by far the largest numbers are generally to be found on more exposed parts—leaves, fruit, and twigs. On open and more scraggy trees, however, the limbs and main branches are commonly

found to carry large colonies of the pest, and it appears that red scale prefers positions exposed to sunlight. It is probably mainly on account of this preference that young trees are so frequently attacked, for in such cases little if any of the tree is effectively shaded.

Red scale is a voracious feeder, and no plant can long sustain the depredations of a large colony. Weakening and killing of leaves and twigs is accomplished rapidly, and young worked trees may be killed back to the union of bud and stock within a few months by colonies which could not be considered abnormally large. Even when actual death does not follow, the damage is often such that the tree never properly recovers. A tree which has been stunted during its early life by red scale, as many are, is rarely worth keeping.

On older trees, apart from the damage done directly by the pest, the trees may be so weakened that they are rendered very prone to attack by other insects, such as the borer *Uracanthus cryptophagus* Oll., and particularly by diseases such as melanose, *Phomopsis citri* Fawcett. Melanose is an ever-present menace to weakened trees in Queensland, and it is by the combination of red scale and melanose that a large percentage of older trees in the State are ultimately killed, or at least ruined.

The weakening effect of red scale on trees is overlooked in some instances. It happens frequently that an orchardist finds that some of his trees are heavily infested with red scale, and applies a spray against the pest. A short time later he notices dead wood appearing in the trees, accompanied by a heavy fall of leaves. He may at once condemn the spray material, overlooking the fact that the parts now dead were greatly weakened by the scale, and that almost any spray material would have completed their destruction. In fact, this would not have been long delayed even were no spray used. Whilst spray injury may have similar manifestations, and often does, every year perfectly good spray materials are condemned because orchardists do not take all the circumstances into consideration.

When infesting the fruit, though direct damage is done, in most cases the chief objection growers have to the scale is that the fruit must be cleaned before it is marketed, and the removal of red scale in large numbers is not very easily accomplished. The fruit must be brushed, and the extra handling, besides costing time and labour, always results in some loss of fruit through injury to the rind. The actual loss directly attributable to the brushing and handling may be small, but, particularly in some seasons and certain districts, the entrance of blue and green mould is greatly facilitated. The direct effects of feeding on the fruit are chiefly arrested development and reduction in size.

The female red scale does not lay eggs, but gives birth to living young. On emergence from the body of the mother the young "crawlers" remain for some little time beneath the scale of the parent. On leaving the protection of the scale the "crawlers" settle down in a very short time as a rule. In tests conducted on this point, it was found that under natural conditions "crawlers" at times had become fixed within thirty minutes of emergence from the scale, and that the great majority had settled by the end of eight hours. A few were found to move about for a whole day or more, but these were comparatively rare. The short duration of the period of crawling no doubt explains to a large extent the comparatively slow spread of the red scale from tree to tree. It

has often been observed that one tree may harbour a large population of red scale over a period of years, whilst surrounding trees remain practically free of the pest. Though other factors may operate, the slow spreading of the red scale was certainly the limiting factor in some instances. The scale is no doubt wind-blown to a certain extent, but it appears that this means of dispersion is less efficient with the red scale than with other species which have a longer crawling period.

The scale breeds freely on fruit stored after harvesting—a point which is of interest and importance to lemon-growers in particular, for the "crawlers" will migrate from fruit to fruit and from box to box. As lemons are commonly stored for fairly long periods, care must be taken to include no fruit carrying living scale in a storage lot.

Some writers infer that reproduction commonly takes place without the intervention of the male. Recent work by Nel,[15] however, shows that this is not to be assumed for California, and in so far as Queensland is concerned males are at all times sufficiently numerous to allow of reproduction being normally bisexual.

Life History.

Red scale young are produced practically continuously throughout the year under Queensland conditions. Even in the coldest weeks in winter young may be found, though at that time the number of "crawlers" seen is very small. It has been found that, though mortality in the winter is high, a proportion of the young then produced successfully establish themselves and reach maturity.

In experimental breeding work it was found that the life cycle occupied a period of little less than two months on the average. During January the average falls appreciably, and at this time some females commenced reproduction in as short as forty-eight days after emergence from beneath the mother scale. The life cycle in general, however, may be taken as approximately sixty days. As the young from each female are commonly found to emerge over a period of about fifty days, it would not be expected that any definition of generations would be found in the orchard, and it is difficult at any time during the warmer months of the year to find any suggestion of a dominant stage.

An experiment was conducted with a view to discovering the number of generations which might be expected in a year. In this work the progeny produced in the first six days by twenty selected females were kept under observation. In the same way the first progeny of the next and subsequent broods were used. It was found that with these individuals there occurred five generations in twelve months. This work was done under somewhat artificial conditions—lemon fruits encased in cheese cloth and hung on small trees being used. The artificial conditions may have had some influence on the results obtained, but it is thought that normally there are five broods each year. Observations suggest, however, that at times a partial sixth brood may appear.

CIRCULAR BLACK SCALE.

Early references to the circular black scale, *Chrysomphalus ficus* Ashm., will be found under the name *Aspidiotus ficus*.. Ashmead described the insect as *Chrysomphalus ficus* in 1880, but subsequently the species was erroneously placed in the genus *Aspidiotus*. This error was rectified later, but for some time the specific name *aonidum* was used.

This name was widely accepted, but it appears that Linne's description cannot be definitely referred to this species, and Ashmead's name *Chrysomphalus ficus* therefore stands.

Description.

The scale of the female (Plate 123) is evenly rounded, and has the central portion raised similarly to that of red scale. The colour is purplish black or black with the central point surrounded by a reddish brown or brown band and the margins almost grey. The scale, like that of the red scale, is of parchment-like texture.

The crawlers are light yellow, and on becoming fixed are quickly hidden beneath a white waxy secretion. The well-grown female is rounded in front and tapers sharply towards the posterior end, the shape of the insect thus somewhat resembling that of a pear. The diameter of the female scale is one-twelfth of an inch.

The scale of the male is similar to that of the female, but is elongate and has the raised portion anterior to the centre. The male insect itself is typical of its class, and similar in general respects to the male red scale. The thoracic band of the circular black scale, however, is much darker in colour than in the case of the red scale.

It is characteristic of colonies of the circular black scale that the young settle down in very close proximity to the mother scale in many cases, and scales of many young may overlap that of the old female.

Distribution and Habits.

Circular black scale is widely distributed, and has been recorded from Florida, West Indies, Italy, Egypt, Ceylon, Japan, and Pacific Islands. Though common in many parts, it is not usually regarded as a serious pest of citrus, and is everywhere less feared than its close ally, the red scale.

There are a large number of plants from which this scale is recorded, the list including custard apple, mango, figs, Hibiscus, palms, and a number of indigenous trees. Like red scale, however, its presence on cultivated plants other than citrus does not cause much concern, and the native host plants rarely provide a material source of infestation to Queensland citrus groves.

In so far as citrus is concerned, though the species is distributed throughout the State, it is only in the hotter and drier parts that it can be regarded as a pest of importance. In more humid and milder climates such as at Tamborine Mountain or on the Blackall Range the species is rarely found on tended trees.

Although circular black scale thrives in the hotter localities, colonies as a rule are found in positions which are protected from much direct sunlight. Thus it is usual to find the pest mostly on the shaded side of the tree or on fruit or leaves well protected by overhanging foliage.

The insects do not become established on woodier parts, and are only rarely seen even on the most tender twigs. At all times of the year leaves are infested, but fruit is usually only attacked from the half-grown stage onwards. Even on lemon trees which are carrying a well-forward crop, the young of the generations hatching between winter and midsummer commonly infest only the foliage. It is the young of the third generation which migrate to the fruits—a fact which is of importance in connection with control.

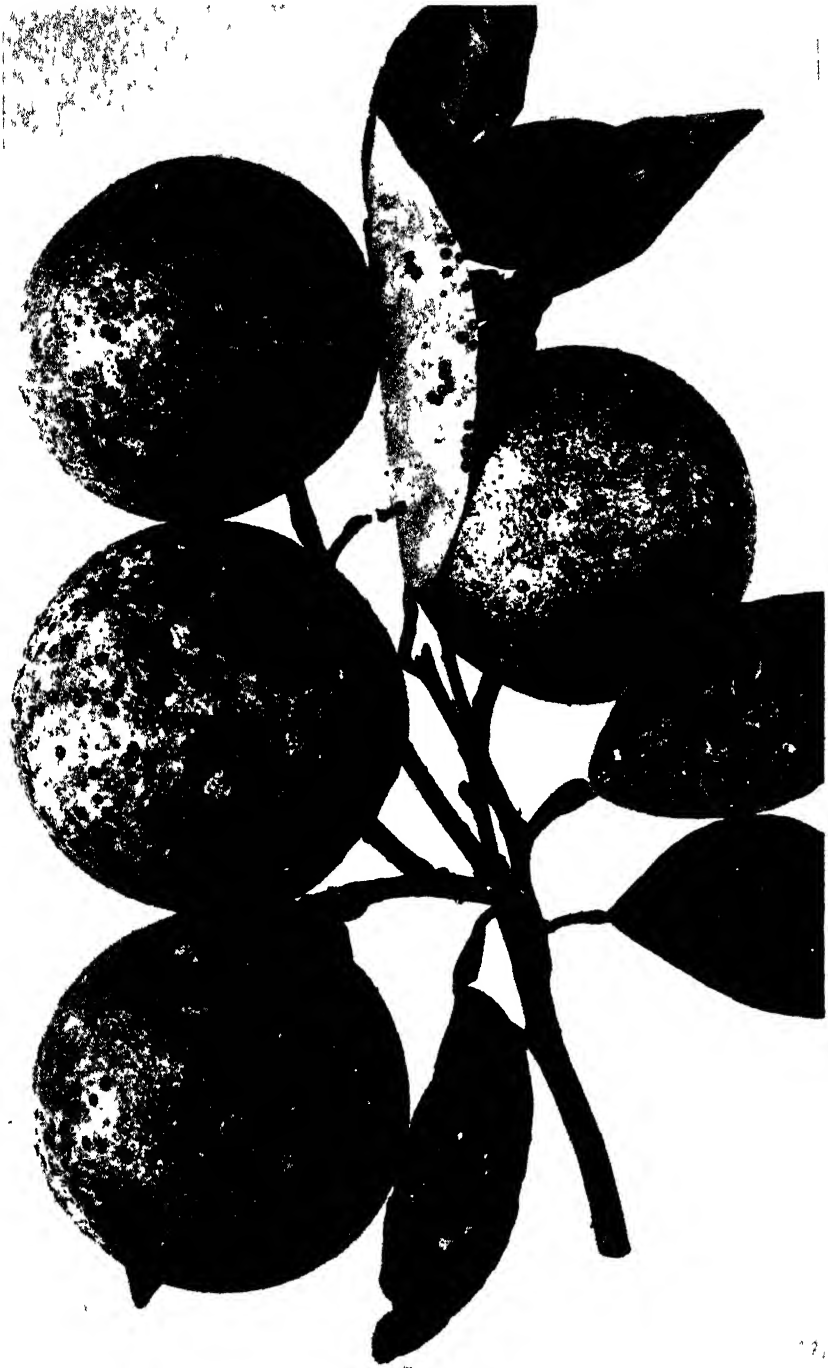

PLATE 123.

Circular Black Scale, *Chrysomphalus ficus* Ashm., showing the normal restriction of infestation to fruit and foliage.

The species cannot be considered a severe pest on the tree, and though marked shedding of the leaves may result, the health of a heavily infested tree does not appear to suffer greatly. The greatest objection to circular black scale as a rule is the disfiguration it causes to the fruit. The scale is particularly conspicuous on a yellow or orange background, and infested fruit must be thoroughly cleansed before being marketed. Apart from the disfiguration, when heavily infested a slight shrivelling of the rind may result, and in some cases retardation of maturation occurs. Younger trees are not often infested to any extent, but older trees of all varieties are attacked. More trouble is experienced by lemon-growers than others, but any variety of fruit which matures after mid-season may favour the development. For this reason mandarins are seldom attacked to any great extent, whilst oranges of late-maturing varieties, such as the Valencia Late, sometimes carry heavy populations of this pest. In particularly dry seasons, however, even the earliest maturing varieties of mandarins may need to be treated for an infestation.

Males of circular black scale are comparatively rare, and it appears that reproduction is normally parthenogenetic—that is, occurring without the intervention of the male. If such a mode of reproduction be normal, when both sexes combine the progeny are sometimes found to be of one sex only. This may account for the fact that at times colonies of circular black are found in which the males greatly predominate.

The adult females produce eggs which hatch very shortly after exclusion, giving rise to the minute, yellow crawlers, which may remain for two days or more beneath the scale of the mother insect. The free crawling stage is of short duration, sometimes not more than a few hours, and the young in many cases does not move any distance away from the site of hatching to settle down to feed. It is not uncommon to find as many as six young settled beneath the scale of the mother insect, and it would appear that this is due in part to the young experiencing difficulty in escaping. This multiple settling under old scales is most noticeable on the fruit, and in tests of scalicides it was found that in every instance where sprays were employed the kill on the fruit was considerably lower than on the leaves. It appears that on the fruit, particularly at times when eggs are being laid, the adult female keeps very firm contact with the surface. This habit of becoming fixed in close proximity to the old insect at times acts to the detriment of the pest, for leaves injured by the insect and shed prematurely may carry large numbers of quite young scales, which are thus removed from the tree with very little, if any, possibility of returning. Migration from tree to tree is much more pronounced with this species than with the red scale, though the spread through an orchard is still very slow.

Life History.

The winter is passed in immature stages, and the first young following this season are to be found about the beginning of September. Though from this time throughout the warmer months young are constantly produced, overlapping of generations does not occur to a very great extent, and while representatives of all ages may be present on any tree, it is usual to find that the great majority of individuals are of approximately the same age, except towards the end of summer, when, as would be expected, overlapping is more pronounced.

The brood produced in September reaches maturity toward the end of the following month or early in November, and a second generation is at once commenced. The development of this second brood occupies November and December, and at about the end of the year—or more typically, early in the new year—a third generation makes its appearance. This third brood infests the trees from January to about the beginning of March, and, as has been mentioned above, it is the young of this brood that first migrate to the fruit. Early in March the fourth generation begins to emerge. The emergence of young of this fourth brood continues over a much longer period than in the case of any other, and consequently there is a greater diversity of stages then than at any previous period. The fourth generation is composed of those individuals which persist through the winter and reproduce again in the following September. The prolonged period of hatching is due to the variation in developmental periods in different individuals of previous generations more than to the fact that the period of fecundity of the females may be prolonged at that time of the year. Owing to the variation in size and evident age of the insects during the winter, the idea is sometimes held that a fifth main hatching takes place during the cold months. This impression is strengthened by the fact that even in the coldest times young crawlers may be found beneath old scales. However, close observation was kept on several hundred females known to be of the fourth generation which hatched at the average time, and these did not reproduce until September. As regards the young which are sometimes found in the winter, these are few in number; and, further, from tests conducted it appears very unlikely that any appreciable proportion of them survives the cold weather. In tests carried out at Nambour the mortality of young emerging between the second week in June and the beginning of August was almost 100 per cent. The effective, and in all probability the actual, number of generations per year then is four.

In the experimental breeding work during the past three years the actual time required for the development of females from emergence from beneath the scale of the mother to the production of young was found to be remarkably constant during the warmer months, the variation for by far the greatest number of insects being but two days—viz., sixty-four to sixty-six days. Small numbers may take either a little less or a little more time, and the shortest period taken was fifty-eight days during February and March, 1931.

MUSSEL SCALE.

For some time mussel scale, *Lepidosaphes beckii* (Newm.), was known as *Aspidiotus citricola,* the name under which it was described by Packard in 1870. A few years later it was transferred to the genus *Mytilaspis,* as defined by Signoret, and it was under that generic name that much of what has been written of the scale in Australia appeared. Later work, however, elucidated the fact that Newman had described the species a year earlier than Packard, and therefore Newman's specific name *beckii* precedes *citricola.* The correct genus has also been found to be neither *Aspidiotus* nor *Mytilaspis* but *Lepidosaphes.* As most of the older Australian books give the name as *Mytilaspis citricola,* the change to *Lepidosaphes beckii* may be confusing.

Description.

The scale (Plate 124) of the female is purple, or in older specimens almost a drab brown. The surface is somewhat roughened. The cast skins or pellicles are conspicuous at the anterior end as a lighter area, though in very old specimens these may be a dark brown instead of reddish, as they more normally are. The margins of the scale are whitish. The scale is elongate, slender, and somewhat mussel-shaped, the sides curved, and the whole convex. The texture is similar to that of the red scale, but in the case of mussel scale is thicker and more leathery.

The adult female is creamy white with the last segment of the abdomen reddish. The body is considerably broadened at the posterior end, and the segmentation of the abdomen is well defined. Beneath is a ventral scale which is entire over the body of the insect. This scale is white and is very easily ruptured. The eggs are laid in irregular formation, and as each egg is produced the female shrinks up towards the anterior, so that finally almost the whole of the space under the scale is filled with the eggs. The length of the female scale is one-tenth to one-eighth of an inch.

The scale of the male is similar in general respects to that of the female, but is smaller, less curved, and rather lighter in colour. The adult male is of the typical winged form.

Many growers style *L. beckii* Glover scale, but though the species are similar they are distinct. Glover scale is very closely allied, but is *L. gloveri* Packard. This species differs from *L. beckii* in that the ventral scale of the former is divided and the eggs, instead of being irregularly arranged, are set in two parallel rows. The female scale of Glover scale is narrower than mussel, and also has the sides straighter. W. W. Froggatt records Glover scale from Victoria and New South Wales, and H. Tryon[16] has recorded it from Queensland on citrus. There are a few dried specimens in the departmental collection labelled Glover scale as from citrus in Queensland. Definite identification of these specimens cannot now be undertaken, however. During the course of this investigation no Glover scale has been found on citrus in Queensland, and if the species attacks citrus in this State it must be very rare. It is probable then that when growers are under the impression that their trees are infested with Glover scale the species is actually mussel.

Distribution and Habits.

Green[1] states that mussel scale is found almost wherever any species of citrus is cultivated. It is common throughout the citrus districts of this State, and though it has been recorded from a number of indigenous hosts, these do not constitute breeding-grounds capable of providing appreciable infestations to citrus orchards. In Queensland the mussel scale is primarily a pest of the coastal parts, and it appears that the low humidities commonly experienced in more inland regions act to the detriment of the pest. In coastal areas the mussel scale is comparable to the red scale in interior parts as a pest of citrus. The damage to the trees is severe and follows rapidly on the occurrence of large populations. Fruit, leaves, twigs, and branches up to an inch in diameter or even larger are attacked. The fruit is usually not attacked until it is fairly well developed, and though a few individuals may be found on them in early January, it is usually not until about the beginning of March that appreciable numbers occur there. On the fruit

PLATE 124

Mussel Scale, *Lepidosaphes beckii* (Newn.), showing infestation of woody parts and resultant death of twigs.

the most favoured sites for feeding are at the stem end against the "button," or, if the fruit be clustered, around the points of contact of the two fruit (Plate 125). Later the colonies extend to any part of the fruit, and dehydration of the rind commonly ensues. If the infestation at the stem end be at all heavy premature yellowing and dropping may result. As well as the direct injury caused by feeding, mussel scale is most objectionable on the fruit, as it is disfiguring and is most difficult to remove by brushing. This scale is a much more difficult one to remove than the red or the circular black scales. Healthy tender twigs are not often attacked, but more woody twigs or those of harsh growth support the largest colonies. Small twigs which support the pest quickly lose vigour, and the scale gradually works its way back along these weakened parts. Such twigs are usually quickly killed by the scale alone, but larger parts generally survive long enough to become infested with melanose or some other such malady, and death is finally brought about by the combination of the scale and that disease. Melanose is very commonly associated with this scale in the more humid parts of the State. Young leaves do not usually harbour the pest, but older leaves, particularly those inside the tree which are protected to some extent, are prone to attack.

It is characteristic of the young to settle down shortly after emergence, and commonly they do not migrate any further from the mother scale than is necessary to find a clear portion of the plant surface. Thus colonies are typically so closely crowded that the scales of all individuals touch or overlap each other, even though there be an abundance of suitable feeding sites within a radius of less than an inch. On woody parts the colonies may be so dense as to form an incrustation completely covering the bark. Such an incrustation may extend from the limit of hardened growth or living tissue back a foot or eighteen inches along the branch. The species does not spread very quickly through an orchard under ordinary conditions, and one or a few trees may carry large colonies for a considerable time before appreciable numbers are found on neighbouring trees. However, when suitable conditions prevail on any tree an infestation quickly follows.

All commercially-grown varieties of citrus are susceptible, but mandarins usually carry more individuals than comparable oranges. Lemons are infested heavily at times, but are seemingly much less attractive than mandarins or oranges. On healthy trees mussel scale in appreciable numbers is usually confined to the immature fruits. The species is, however, essentially a pest of weakened trees. Mussel scale is second only to red scale in importance as a citrus scale pest in Queensland, and as will be seen by comparison, the two species have much in common, the one predominating in coastal parts and the other in the interior.

Life History.

In experimental breeding work it was found that during the warmer months of the year females may produce eggs within about sixty days after emergence. The great majority of individuals, however, require about sixty-five to sixty-seven days in which to complete the life cycle. Eggs are produced throughout the year, and with no other species found on citrus is effective winter reproduction so pronounced. Even in the coldest times the crawlers are able to become established and natural mortality in the winter is not at all high.

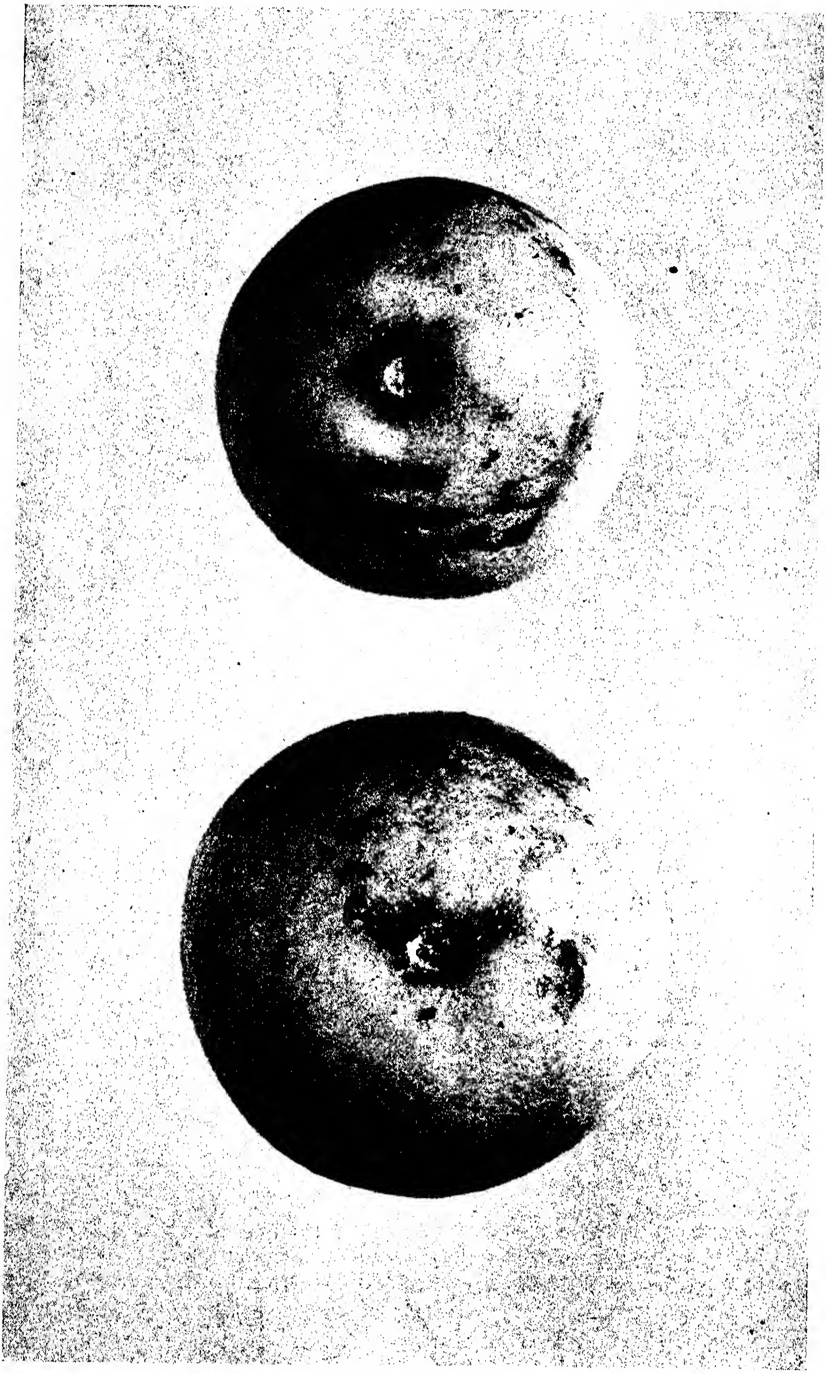

PLATE 125.

Mussel Scale, *Lepidosaphes beckii* (Newn.), showing infestation of fruits at point of contact and at stem ends.

A month may elapse between the times of hatching of the first and the last egg produced by one female, and thus there is no defined succession of generations. At only one period of the year is any suggestion of a pure brood to be observed. This occurs at times during February, and at this time colonies are frequently found in which almost every individual is of approximately the same age—adult females just ready to lay or laying. From this it would appear possible that the typical hot dry January weather is responsible for a high mortality of young. It is probably on account of this also that the insect is relatively unimportant in interior districts.

From the period occupied in completing the life cycle it appears probable that there are four generations each year.

WHITE LOUSE.

When first examined, White Louse, *Chionaspis citri* Comstock, was not recognised as a distinct species, but was included by Comstock in the species *Chionaspis euonymi*. Comstock, however, observed certain differences, and in 1883 he described this insect as a separate species, and gave it the name of *Chionaspis citri*.

Description.

The scale of the female (Plate 121, fig. 2) is a dull brown or almost black colour, with grey margins, and with the brown or yellowish pellicles rather prominent at the anterior end. The shape is somewhat similar to that of the mussel scale, but the curving of the sides is much less pronounced or may be quite absent, and instead of being regularly convex, along the central line there is a ridge from which the sides slope away to the margins. The scale, which appears comparatively thick, is parchment-like in texture, and is commonly covered with minute particles of dust which adhere readily to it. The adult female (Plate 121, fig. 3) is creamy coloured, elongate in outline, and has the abdomen rather deeply segmented. The scale of the male (Plate 121, fig. 4) is white and carries three distinct longitudinal ridges along practically its whole length. The pellicles, when fresh, are yellowish, but later turn brown and are not readily seen unless the insect be removed from the plant. The adult male (Plate 121, fig. 6) has a light-yellowish body, and is normal in general form. The crawlers are elongate, yellowish in colour, and rather more robust-looking than in most other species. The length of the female scale is one-sixteenth of an inch, and of the male scale one-twenty-fifth of an inch.

Distribution and Habits.

White louse was originally obtained on orange trees in Louisiana and Cuba, and it is considered probable that it was imported into New Zealand and Australia from America. In Queensland the species is common in all parts where citrus is grown, and citrus appears to be the only host plant which has been recorded, either in Australia or elsewhere.

White louse differs from all other citrus scales in Queensland in that the males are much more in evidence than the females, and growers are very seldom familiar with the latter sex of this species. The young seek depressions in the bark in which to settle, and the females adhere very closely to the host plant. As they are commonly covered with dust

and other foreign matter and their colour harmonises with that of unhealthy bark, it is often rather difficult to find the females. The males are not only more conspicuous in themselves but are always abundant, the males commonly many times outnumbering the females. A heavily-infested tree may appear from a little distance to have been whitewashed, but even the closest examination of such a tree without a hand lens will possibly not disclose the whereabouts of a single female. That the vernacular name should be derived from the appearance of the male is therefore not surprising though rather extraordinary.

The white louse thrives in many different climates, and temperature does not appear to exert any marked effect on the degree of intensity of infestation. Humidity, however, does seem to be of importance, and in any district the pest is much more in evidence in dry than in wet times.

All aerial parts of the tree are affected, but the white louse is essentially a pest of the trunk and main limbs. Infestation usually commences on the trunk a foot or two from the ground and spreads upwards. On the trunk and main branches, attacked bark becomes hard and dark in colour, and the tree presents a hidebound appearance. Vigorous trees carrying large colonies usually show a cracking of infested bark. These cracks may serve as a point of entrance for the borers *Symphyletes sodalis* Pasc. and *Uracanthus cryptophagus* Oll., or other detrimental organisms. Gumming commonly results when the bark splits, particularly if this happens low down on the tree.

Fruit, leaves, and twigs are also susceptible to attack, but white louse is seldom found on these parts of tended trees. The extent to which the scale will disperse through the tree is governed to a very large extent by the general health of the tree, the less vigorous the tree the further the scale penetrates from the trunk. Leaves and twigs may be badly damaged, but white louse does not bring about the death of these parts with anything like the rapidity of red or mussel scales. Whilst the fruit is rendered unsightly by the presence of the scale, this is rarely of importance, as, if an appreciable proportion of the fruit carry the insect the trees are so unthrifty that the total crop will certainly be small.

All varieties of citrus are attacked, but mandarins as a rule do not harbour nearly as many individuals as comparable lemon or orange trees. Young trees are seldom attacked to any extent. That the scale is not of greater importance is due mainly to the fact that it is fairly easily controlled. The conspicuous males ensure that attention will be drawn to colonies before these become very large. The damage to the trunk, however, is often such that orchardists must regard this species as potentially a very bad pest. The small amount of damage done at times by very large colonies is no doubt due to the fact that the females may form but a very small portion of the population.

Life History.

Under orchard conditions in Queensland white louse breeds practically continuously throughout the year. Young may always be found, though the number present in the winter is small, and mortality at that time high. In experimental breeding work females required on the average about sixty-five days in which to complete their development. As young may be produced by any one female over a period of from three to six weeks, there is no clearly defined succession of generations. A fairly large hatch is noticeable early in September, but apart from

this, under field conditions the seasonal life history is featureless, and little assistance in the matter of control is to be gained by a detailed knowledge of it. From experimental breeding work in which selected individuals of each brood were used, five generations were secured in twelve months, and from this and field observations it appears that there are ordinarily five generations, four of which are large and the fifth (that occurring in the autumn and winter months) small.

HEMISPHERICAL SCALE.

The hemispherical scale, *Saissetia hemispherica* (Targ.), was first described by Targioni-Tozetti in 1867. Originally it was placed in the genus *Lecanium*, and under that generic name it became widely known both to entomologists and agriculturists. The old genus *Lecanium* has now been divided into several smaller genera, and the hemispherical scale has been placed in that section now known as the genus *Saissetia*.

Description.

The species (Plate 126, fig. 6) is easily distinguished from the other citrus scale insects. The recently-hatched young are very pale-yellow and active, possessing well developed legs and antennæ. When first settled, the young females are only very slightly convex, but gradually become more so until finally, by the time maturity is reached, the shape is almost hemispherical with narrow flattened margins. The recently-settled young are light brown, and as development proceeds the dorsal or upper surface darkens and ultimately is shining brown or reddish brown. In immature stages three ridges on the dorsal surface intersect to form an elevated "H," but later this marking disappears, and in full-grown specimens the surface is quite smooth. This "H" varies in prominence—in some individuals it is very distinct, whilst in others it is scarcely discernible. Seen under a hand lens the dorsal surface has a marbled appearance, due to the fact that the thickening of the derm is not uniform. The female insect does not secrete a scale, but remains naked throughout life. The thickened dorsal derm, however, somewhat resembles a true scale in appearance.

On completion of egg-laying the mother insect dies and quickly dries out, and the body is drawn up against the dorsal derm. On removal from the plant it is found that the insect has become merely a hollow hemispherical-shaped shell, beneath which is a space loosely filled with a mass of minute, white eggs. The female scale is very variable in size, the average length being about one-tenth of an inch.

The male insect is at first naked and cannot be distinguished from the female. After the second moult, however, the males secrete a true scale which is transparent and of glassy appearance. The male hemispherical scale is rarely found in Queensland.

Distribution and Habits.

The insect is very widely distributed, and has been recorded from practically every civilised country. Throughout the tropics, it is common on a very large number of plants under natural conditions, and in temperate and colder parts it becomes a pest in greenhouses. The list of host plants is long and comprehensive, including as it does species from

many families of plants. Coffee, custard apple, crotons, gardenia, chrysanthemums, and several kinds of fern are some of the cultivated plants which the insect will attack.

Hemispherical scale is to be found in every major citrus-producing district in the State, but it is seldom that it becomes a pest of any importance. It reaches its maximum intensity in coastal parts, and the heaviest infestations occur on the Blackall Range, but even there it is confined in large populations to but a few orchards at any one time, and then only a small proportion of the trees are affected in the great majority of cases.

In settling down the young usually choose the very young soft twigs, and the insects are very rarely found on growth that is at all hardened. After settling down to feed the insects do not move again until the time of reproduction approaches. Then the females may migrate from the twigs to the leaves, or less often to the fruits. When small colonies only are on a tree the presence of an infestation may remain unobserved during the larval period, for the very young make use of any depression, and later the colour harmonises well with that of the twigs. However, the habit of the adult females of migrating may disclose their presence at about the time of reproduction, for they are then larger and take up exposed positions.

Large colonies of the insect may be accompanied by a growth of sooty mould, but the presence of this fungus is not a characteristic of the species, and very large colonies may be quite free of any such growth.

All varieties of commercial citrus are attacked, and though lemons are seldom found to carry an appreciable number of the pest, this is probably due to factors other than varietal ones. Beauty of Glen Retreat mandarins appear to be rather more favoured than any other commonly grown variety. Irrespective of variety the largest populations occur on trees two to four years old, which carry abundant foliage and much tender growth. Even on these trees the amount of injury sustained is rarely of any moment, and only exceedingly heavy infestations need cause concern. The species is, then, of little economic importance, though there are occasions when it becomes necessary to apply artificial measures against the pest.

Life History.

The hemispherical scale completes its life cycle rather more quickly than do most other species of citrus scales. The period elapsing between egg-hatching and production of eggs for the following generation varies in most individuals from forty-eight to fifty-six days during the warmer months. The insects over-winter in immature stages. Maturity is reached during September by most of the over-wintering females, and there is usually a large hatch of eggs during the second fortnight of that month. Following this, other main hatches occur as a rule in early November, late December, in February, and again in March or early April. There are thus five main broods each year. However, at almost any time other than towards the middle of winter, eggs, and therefore after November, all stages, of the insect may be found. The main broods are, however, usually well defined, and when a large colony is found the great majority of the individuals are in the same stage of development, and this stage will generally be found to be that which would be expected from the times given above in connection with main hatchings. This

is so because the rate of development of individuals from any one batch of eggs is fairly uniform. Large populations are built up only in abnormal circumstances, which circumstances are naturally quite temporary, and unless the effect is felt by the large majority of individuals in the colony, it will not be far reaching. The hemispherical scale is kept in check to a very large extent by natural enemies, and the abnormal circumstance is usually the failure of an effective parasite. In the case of small colonies the individuals are usually in the same stage of development, though they may differ greatly from the average for the species.

OLIVE SCALE.

The olive scale, *Saissetia oleæ* (Bern.), was first described by Bernard in 1782 under the name of *Chermes oleæ*. From time to time since then it has been placed in several genera, but the only other name under which much has been written of the species is *Lecanium oleæ*. As has been mentioned above in connection with the hemispherical scale, the genus *Lecanium* has been redefined, and this species is now in consequence known as *Saissetia oleæ*.

Description.

There has been a great deal of confusion in Queensland in connection with this scale (Plate 126, fig. 5), and orchardists and others commonly refer to the hemispherical scale as the olive scale. Though the two species are closely allied, there is not much similarity in general appearance, and it is difficult to account for the error. The description of this species should be checked against that for the hemispherical scale in any case of field identification.

The adult female is brownish-black, or under Queensland conditions almost quite black, with a little speckling of white. The outline is roughly oval and the margins are irregular. The surface is roughened, and there is a persistent and prominent "H" marking on the dorsal surface. It will be noted that in the hemispherical scale this "H" marking disappears before maturity, whilst in the olive scale it is present in the adult females. The female is strongly convex, but does not present the regular hemispherical shape typical of its ally, *S. hemispherica*. The length of the female scale is about one-seventh of an inch. The male has not been found in Queensland.

Distribution and Habits.

Olive scale is widely distributed throughout the world, having been recorded from Europe, South Africa, Ceylon, the United States of America, and other smaller countries. It appears, however, to be of more importance in temperate than in tropical countries. In the course of recent investigations the species has been found in the south-eastern portion only of Queensland. It may, of course, occur in other parts of the State on other plants, or citrus in small centres of production, but if so it would appear to be uncommon on them. The scale attacks numerous plants, both cultivated and wild, but it is seldom a pest of importance on any host. The best-known host plants are olive, rose, figs, guava, and some species of deciduous fruit trees. In so far as citrus in Queensland is concerned, the species is of no importance whatever. In the course of the last five years only about thirty small colonies have been found

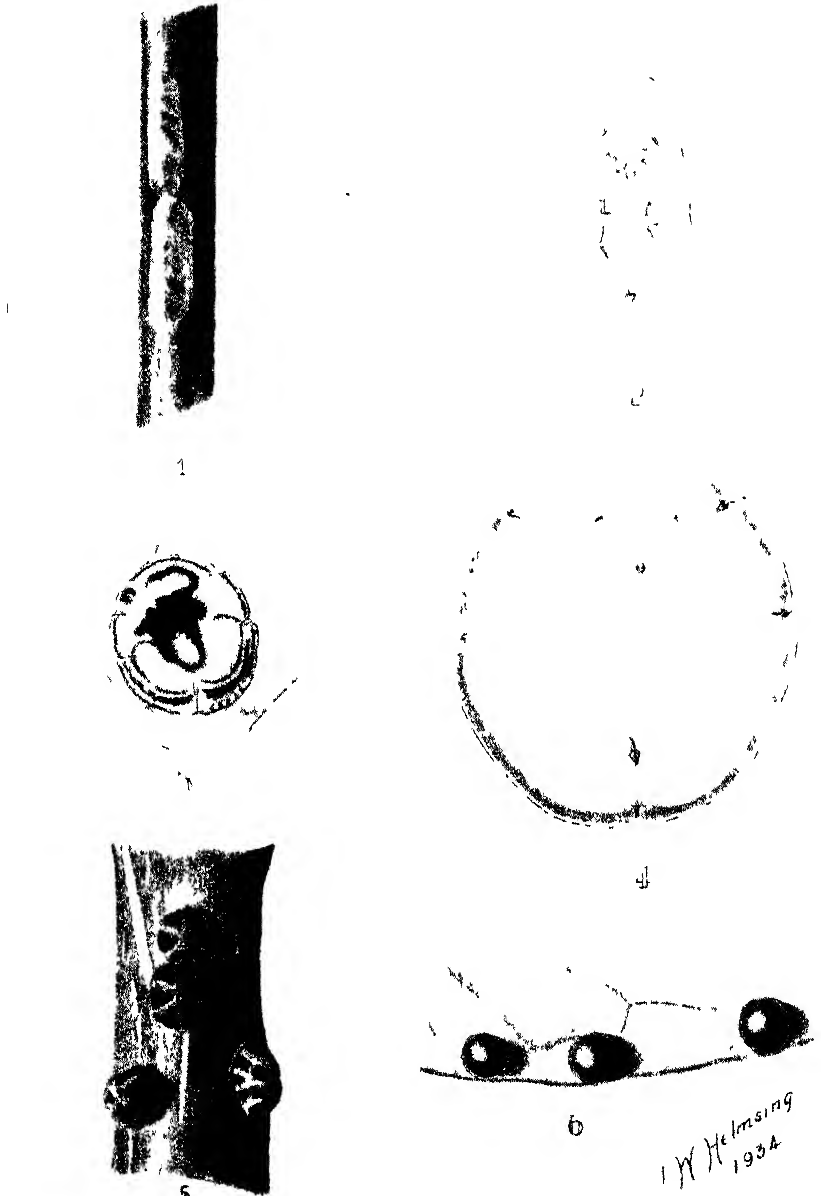

PLATE 126.

Fig. 1, Long Soft Scale, *Coccus longulus* (Douglas), on stem × 3. Fig. 2, Microscope mount of Long Soft Scale × 8. Fig. 3, Flat Scale, *Paralecanium expansum* (Green), on leaf × 3. Fig. 4, Microscope mount of Flat Scale × 8. Fig. 5, Olive Scale, *Saissetia oleæ* (Bern.) × 3. Fig. 6, Hemispherical Scale, *Saissetia hemispherica* (Targ.) on leaf × 3.

on citrus in this State. Under these circumstances very little work has been done on the pest. Attempts were made to establish colonies on laboratory trees without success. From accounts given by Quayle (5), Woglum (6), and others, of the pest in the United States, it appears that in California this species rivals red scale in importance as a pest of citrus. This is due, no doubt, in part to the fact that in certain areas in that country *Saissetia oleæ* is resistant to cyanide. A sooty mould fungus accompanies colonies of the pest, and this adds to the injury suffered by citrus-growers affected by this species. Quayle states that high summer temperatures limit the distribution of the species in California, and this may be largely the cause of the unimportance of the insect in Queensland. From the limited observations possible in this State it appears that, though the insect is to be found on succulent parts, it will attack parts much more woody than the hemispherical scale.

Life History.

As has been mentioned, in view of the status of the species in this State, very little work has been done on this insect and the life history under Queensland conditions is not known. Quayle states that normally in most districts in California there is but one brood each year, the main egg-laying period being in mid-summer (corresponding to November, December, and January in Queensland). The same writer states that irregular hatchings occur in his country, and from field observations on a very limited number of specimens it would appear that irregular hatchings are a feature of the life history in this State also, if there be but one brood per year here.

SOFT BROWN SCALE.

The soft brown scale, *Coccus hesperidum* (Linn.), has been known for a very long time, having been described by Linnæus in 1735. Since that time it has been given more than a dozen names, but *Lecanium hesperidum* is the only one of these of much interest. It is under this generic name that the species is most widely known in Queensland, but this no longer stands, and the insect is correctly called *Coccus hesperidum*.

The minute crawlers are pale-green or yellowish-green, and are elongate oval in shape. They do not as a rule migrate far from the site at which they were produced, and thus colonies may persist in one small portion of a tree for a long period without the infestation spreading to other parts of the tree. The immature settled females are flat, naked, and rather yellowish in colour. The adult females are somewhat convex, and are roughly oval in shape, though rather longer than broad. The colour varies from yellowish-green to very dark-brown. Under a hand lens the dorsal surface is seen to be marked with numerous brown dots, which at times may form ill-defined and somewhat wavy lines. In all but the darkest specimens the eyes are conspicuous as brown or black points situated close to the margins at the anterior end. The scale is very commonly parasitised in Queensland, and the presence of internal parasites in the body may affect the colour of the scale insect. Thus a colony rarely presents a uniform appearance as regards colouration. The length of the female is one-eighth of an inch.

Distribution and Habits.

The soft brown scale is widely distributed throughout the world, having been recorded from Europe, North and South Africa, Japan, Ceylon, North America, Brazil, and other countries. In Queensland the species appears to be confined to the southern portions of the State remote from the tropic. The insect has been recorded as attacking many plants both cultivated and wild in other countries. W. W. Froggatt[12] states that it occurs on many cultivated plants, and even native shrubs in Australia. In the course of this investigation it has been taken on only one indigenous plant—namely, river cherry (*Eugenia* sp.). A few individual scales closely resembling *C. hesperidum* were found on *Hibiscus heterophyllus* Vent., but the specimens, all of which were parasitised, were not suitable for definite identification. At all events the question of native hosts has no bearing on the control of the scale on citrus.

The scale is a very rare one in citrus orchards in this State, and though on occasions isolated large colonies may be found, these are very soon attacked by natural enemies, and never persist longer than one generation. Soft brown scale feeds only on the most tender parts of the tree, and mandarins appear to be more favourable to the insect than other varieties. Even the heaviest infestations so far encountered in this State, however, have been cases in which a few twigs on but one or two trees in an orchard were affected, and the scale is of little consequence from an economic point of view. Under present conditions growers need not be concerned about it as a pest of citrus.

Life History.

Under the circumstances little work has been done on the life history of the species. Colonies were established under experimental conditions for observations, but the percentage parasitism of these colonies was always so high that very few individuals could be used in this work. The time taken for the completion of the life cycle by those females which escaped parasitisation varied from sixty-one to sixty-seven days during the warmer months. From this and other observations it seems that there are normally four generations per year. The late summer generation appears to be the largest, but from February onwards the parasites are particularly numerous, and any great increase in population is thus unlikely even at that period of the year. From the very limited field observations it appears that generations are fairly well defined, and that no considerable irregular hatchings take place.

LONG SOFT SCALE.

Long soft scale, *Coccus longulus* (Douglas), was originally described by Douglas in 1887 and given the name *Lecanium longulum*. It was known under this name for many years, but when the division of the genus *Lecanium* was brought about this species became part of the genus *Coccus*.

Description.

The crawlers are elongate, light-coloured creatures which move very quickly about the plant before settling down to feed. The female (Plate 126, fig. 1) does not secrete a scale, and though the dorsal derm is thickened the insects are quite soft until reproduction commences when

the derm appears rather scale-like, and tougher, but even then it is by no means hard. The general colour is light-brown, or at times somewhat yellowish, with the margins darker than the remainder. The eyes can be observed as dark spots situated towards the anterior end and near the margins. The scale is convex and presents the appearance of a half-cylinder with the edges flattened. Newstead[7] records that some specimens resemble very much the soft brown scale (*C. hesperidum*), but this has not been observed in Queensland specimens, and the scale can be easily distinguished from all other citrus scales in this State by its light colour in conjunction with its long narrow shape. The male of the species has not been observed in Queensland. The length of the female is one-fifth of an inch.

Distribution and Habits.

The long soft scale has been recorded from England (on exotic plants), Massachusetts (U.S.A.), Pacific Islands, Ceylon, and other parts. In Queensland it is rarely found on citrus except in tropical districts, where at times it becomes plentiful. The heaviest infestations so far observed were at Yeppoon and Bouldercombe, in the Rockhampton area, whilst appreciable numbers may at times be found on isolated trees at Gayndah. Apart from citrus, the only plant on which the scale has been found in the course of these investigations was custard apple. Several other host plants have been listed in other countries, and though the scale possibly infests these or allied trees in Queensland, the existence of alternative hosts is of little importance to local citrus-growers. It is of interest to note that the long soft scale may frequently be found on custard apples in regions much further south than those in which only an odd individual has been seen on citrus, even though this latter host be growing in the same locality. Dry seasons appear to favour the insect.

The young settle down on tender twigs, and the remainder of the life of the female is spent there for the most part. However, reproducing adults may be found on the leaves always close to the midrib, and it appears that such individuals migrate to the leaves just before reproduction is commenced. The presence of a colony is usually denoted by a copious growth of sooty mould, and in all cases noted the presence of this fungus has been the most objectionable feature of the infestation. The insect itself apparently does not affect the tree to any marked extent, and the amount of injury following even quite heavy infestations is slight.

Mandarins are the only trees on which any large colonies have been found, and it appears that the Emperor of Canton variety is the most preferred of those commonly found in Queensland orchards. As will be mentioned later, the pink wax scale also commonly infests this variety of tree, and it is of interest to note that in no case have both of these species been found in appreciable numbers on the one tree. In quite a number of places where pink wax has been found thickly infesting surrounding trees, those carrying the long soft species were either almost or quite free of the former species.

Life History.

All attempts to establish colonies of the long soft scale on experimental trees at Nambour have failed. The failure may have been due in part to unsuitable climatic conditions, but possibly the same factor which influences the incidence of the species on certain trees as outlined above

was also operating. The information on the life history, then, is confined to what has been obtained from field observations. The broods appear to be distinct, and reproducing females have been found in November, late January, and late March. From this it would appear that a fourth hatching might occur in or about September. This, however, has not actually been observed. It is considered very probable, however, that the insect completes four generations each year.

FLAT SCALE.

The flat scale, *Paralecanium expansum,* was described by Green in 1896 as *Lecanium expansum,* the generic name becoming *Paralecanium* when the division of the larger genus took place.

Description.

The scale (Plate 126, fig. 3) is quite different in appearance from all other species occurring on citrus in this State, and there is no likelihood of any confusion in identification. The immature females are so flat as to appear as merely a single thickened tissue on the surface of the leaf, and even the adults at the time of reproduction are only very slightly convex. The adult female is almost circular in outline, but is slightly longer than broad and somewhat tapering to the anterior end. The regularity of outline is broken by two indentations on each side, and one at the posterior end known as the anal cleft. The colour is brown or green, with the margins darker. Owing to the flatness and the harmony of the colours with that of the leaf surface, the scale is not very readily observed on the plant. The length of the female is one-fifth of an inch. The male has not been observed in Queensland.

Distribution and Habits.

The species appears to have been taken only in Ceylon and Queensland. Green[1] records it from Dalbergia and Litsea in the former country, and W. W. Froggatt[2] states that he obtained it on Moreton Bay fig at Maryborough (Queensland). The only specimens obtained from citrus were taken in the Cooroy district, and this appears to be the first record of the insect from that host. It is not common even in the Cooroy district, and information on the species as a citrus-feeding insect is therefore very slight. Both surfaces of the leaves are chosen as feeding-grounds, and the insects settle on the blade and not necessarily close to the midrib. Froggatt noted that sooty mould was associated with the species at Maryborough, but in the light infestations seen at Cooroy this fungus was not present. Parasites of the scale appear to be fairly active, and none of the affected trees suffered appreciable injury over a period of two years when carrying light infestations.

Life History.

No work has been possible on the life history, and beyond the fact that young emerged in April, 1932, and did not mature before June of that year, nothing is known of the breeding of the insect.

PULVINARIA SCALE.

Pulvinaria scale, *Pulvinaria cellulosa,* was described by Green[1] in "The Coccidæ of Ceylon," Part IV.; there does not appear to be any known synonyms of this name.

Description.

The young (Plate 127, fig. 4) are very pale green, elongate, and very slightly convex. As development proceeds the colour darkens considerably. The insects usually become fixed on a twig with the anterior end downwards towards the limbs, and the conspicuous eye spots are therefore seen at the lower end of the specimens on the plant. The adult female (Plate 127, fig. 2) appears almost dark green to the naked eye, but with the aid of a lens it can be seen that the ground colour is light and that the dark colouration is confined to a series of spots. These spots are most numerous in the median area, and thus the colour becomes lighter as the margins are approached. The adult female is naked, elongate, and convex, and the anal cleft is well defined. The eggs are deposited in a snow white ovisac (Plate 127, fig. 1) composed of closely compacted cottony material. As the ovisac is built up the posterior of the insect is gradually raised, and finally the body of the insect, which dries out and becomes lighter in colour, is seen as a scale-like formation resting on the anterior end of the ovisac, partly covered with the white cottony secretion, and with the posterior end so raised that the whole is almost perpendicular to the surface of the leaf.

The male of this species has not been found in Queensland, and Green in his original description of the insect mentions that the male was not seen by him.

The length of the female is about three-sixteenths of an inch prior to the formation of the ovisac.

Distribution and Habits.

From the available literature it appears that *Pulvinaria cellulosa* has been found in Ceylon and Queensland only, and it seems probable that it was introduced to this State. Citrus is the only host plant of the insect known. In Queensland the species appears to be confined to the southern districts, and reaches its maximum numbers on the Blackall Range and the surrounding coastal country. Dry seasons appear to favour the development of the pest, but it is seldom found in the drier regions, and it would appear that high temperatures are a limiting factor in its distribution. It is seldom that an entire tree is infested by Pulvinaria, and even when very large populations are present they are confined as a rule to a few branches of a tree. The young scales almost without exception choose a twig when settling down, and from that time onward usually remain fixed until mature. Occasionally, however, an immature individual will suddenly commence to wander about the plant, and less often practically the whole of a colony in one position will move away to another part. The normal procedure, however, is to remain fixed, and these chance movements of positions are brought about mostly by unsuitable food supply, or similar unfavourable circumstances. When mature, the females almost invariably leave the twigs and take up a position on a leaf, and it is there that the formation of the ovisac takes place. Though the young are not readily seen, the presence of a large colony is usually betrayed because of this migration of adult females. The snow white ovisac is large and conspicuous, and further,

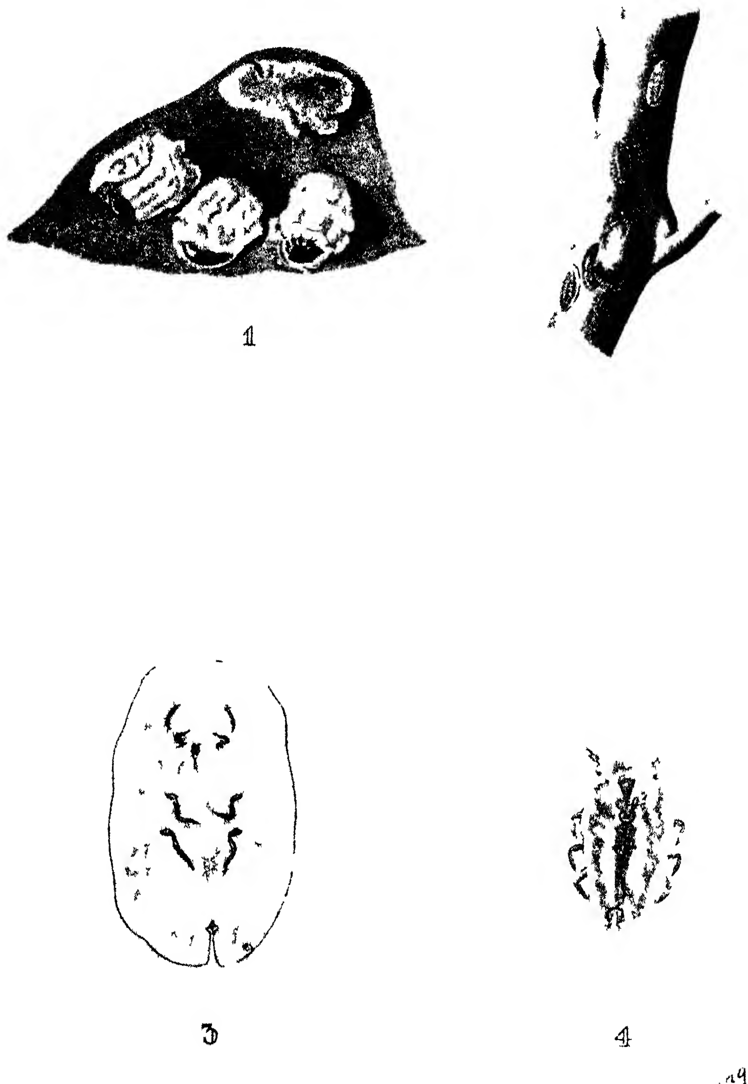

PLATE 127.

Pulvinaria Scale, *Pulvinaria cellulosa*, Green Fig 1, Females with ovisacs × 3. Fig 2, Adult female and second stage nymphs on stem × 3. Fig 3, Microscope mount of adult female × 8. Fig 4, Microscope mount of first stage nymph × 60.

though it disintegrates soon after its function of housing the eggs is complete, a little of the cottony material remains adhering to the leaf for weeks or even months after the young have emerged. These remains mark the outline of the old ovisac, and the consequent scar-like marking produced on the leaves is very noticeable if present in any numbers. This is of value to the grower in the matter of combating the pest.

The Pulvinaria scale is not a very injurious insect, and small twigs may carry considerable numbers for several months before any appreciable damage is done. However, on older trees it is the fruit-bearing wood which carries the infestations, and the size of the fruit may be affected. Often the most objectionable feature of an infestation by Pulvinaria is that sooty mould accompanies it. The growth of this fungus may be very considerable, and as it is the bearing wood that is commonly infested, the fungus readily spreads to the fruit.

All varieties of citrus are susceptible to attack, but lemons are usually less heavily infested than neighbouring trees of other varieties. Very young trees usually escape heavy infestation, and it is on four to six year old trees that the largest populations are found. Provided, however, the tree carries a supply of tender twigs, climatic conditions constitute the only factor of importance in determining the incidence of the pest.

Whilst Pulvinaria cannot be considered a very important pest at the present time, it is still much more than a minor one, and its distribution within the districts where it occurs is undoubtedly becoming more general. Though the abnormally dry seasons recently experienced no doubt have had some influence on the position, growers would be unwise to rely too much on the probable return of normal seasons to cope with the increase. The control of the species should therefore not be taken lightly.

Life History.

There are two generations of Pulvinaria each year. Egg production is spread over two months, or a little longer, at the commencement of each generation. The winter is passed in immature stages, and ovisacs are secreted typically in October. A few may even appear late in August, whilst eggs are still to be found well into November. From the secretion of the ovisac to the emergence of young may require up to twenty-three days, but fourteen days is about the average. November, December, and January are spent in immature stages. Towards the end of January, or more typically early in February, reproduction is again commenced. A small proportion of females do not commence ovisac formation until early in March. The young then produced are those which give rise to the succeeding spring generation. Though there is a good deal of unevenness of the times of egg production by different females, this is of little moment, for the rate of development is so slow that overlapping of generations is only manifest for a few weeks, and in no way interferes with effective artificial control.

[TO BE CONTINUED.]

Tobacco Soils of Queensland.

By W. J. CARTMILL, B.Sc., Analyst.*

ALTHOUGH the tobacco districts of this State are distributed over a wide area the soils, in general, show a close similarity in type. This is explained by the fact that the demand at present is for tobacco possessing specific qualities, which experience has shown can be raised only on soils of a certain type.

The tobacco plant readily adapts itself to a wide range of climatic conditions; it can be grown on almost all types of soil, and it has a comparatively short season of growth. The crop could therefore be grown in any part of this State, excepting perhaps those areas where extremely dry conditions prevail. But while it can be so universally grown the quality and aroma of the leaf are greatly influenced by soil and climatic conditions. Obviously, then, the crop can be grown profitably only in certain districts which produce a leaf having certain specific qualities which render it acceptable to the manufacturers.

The industry has become specialised to such an extent that the demand is for leaf of a regular and uniform quality that can be adapted to certain specific purposes. It is not worth while growing a tobacco of a nondescript type, for this is both unprofitable to the grower and detrimental to the industry. The tobacco-grower therefore should understand what quality leaf is in demand, and the soil and climatic conditions which are required to produce this leaf.

So far as the soil is concerned, under given climatic conditions the type of tobacco produced will depend on the character of the soil, both as regards its physical and chemical nature, especially the former.

The physical composition largely determines the texture, which is an important property of all soils. The texture is an indication of the coarseness of the grains and is determined by a mechanical analysis of the soil, which consists in separating the soil particles according to their sizes into grades which are distinguished as sand, silt, and clay, and determining the quantities of each.

In order to produce a good quality tobacco leaf the plant must have a fairly rapid and uninterrupted growth. Several factors influence this, particularly climatic conditions and soil fertility; but the influence of soil texture is also great. The soil should be loose and friable so that moisture can permeate through readily, and not at any time tend to conditions of saturation.

There is evidence which seems to establish the fact that a well cultivated loose soil lessens the incidence of fungus diseases. As a rule the lighter the texture—that is, the less clay it contains—the thinner is the texture of the tobacco leaf and the more elastic, pliable, and better the quality of the leaf produced. In the case of tobacco, probably more so than any other crop, the texture and physical properties of the soil influence the physiology of the plant to such an extent as to determine and control the distribution of the distinct types of tobacco.

* In a broadcast address from Radio Station 4QG.

Heavy fertile soils will not produce fine tobacco of any variety. Soils containing a large proportion of clay, or which for other reasons are very retentive of moisture, tend to produce large heavy plants which cure a dark colour. On the other hand, a light sandy soil produces plants with thinner leaves which by proper treatment can be cured to a bright yellow or light mahogany colour.

Cigarette and Pipe Leaf.

The type of tobacco produced in Queensland is confined almost entirely to that suitable for cigarette and pipe mixtures. These demand a thin, elastic, oily leaf of bright colour. The general type of soil found suitable for the purpose is an infertile sandy soil or sandy loam. On account of their infertility these soils, as a rule, are not well adapted to the production of most of the staple agricultural crops.

Tobacco has been grown in various parts of Queensland for upwards of sixty years, but it is only during recent years that the industry has taken a prominent place in Queensland agriculture. Hitherto a tobacco of a nondescript type had been produced, having been grown without much regard to the type of soil or climatic conditions, and for this product there was only a limited market.

Since tobacco is a crop that is grown mostly in tropical and semi-tropical climates, and on soils which are fairly infertile, one would expect to find in Queensland some areas suitable for the production of a desirable quality of bright tobacco. In 1927 and 1928 experiments were inaugurated by the Agricultural Department in collaboration with the Australian Tobacco Investigation to discover if such areas existed. Exploratory plots were laid out in various parts of a large area of country in North Queensland, extending from Mareeba down to Bowen and inland for a distance of about 200 miles. Several types of soil were selected as being likely to prove suitable for the crop. The results of these experiments were very encouraging, and further trials were laid out in 1928 and 1929 with equally good results.

Thus it was established that certain areas in the North had potentialities as being centres of a new and important industry. Since then other areas in the coastal semi-tropical parts of the State, where the soils bear a similarity to those in the North, have given promise of becoming important producing areas.

In North Queensland, the largest district is Mareeba in the Cairns hinterland. This district comprises a large tract of country extending from Mareeba proper westwards to Dimbulah, and is a number of square miles in extent. Further north the industry is being developed in the vicinity of Leura. Other areas in the North are Hervey's Range and Woodstock (near Townsville), Charters Towers, and Bowen.

The districts in Central Queensland comprise Sarina and Koumala (south of Mackay), Miriam Vale, and Bundaberg. A little tobacco is grown in the neighbourhood of Rockhampton.

In Southern Queensland the principal areas are Park Ridge (near Brisbane), Beerburrum, Inglewood, and Texas.

Mareeba.

The Mareeba area in the North is the most extensive in the State and embraces a large area of poor sandy hitherto undeveloped country. The topography is made up mostly of broad, gently sloping ridges, hilly and rocky in places. The country is drained by the Barron River and by several creeks which flow into the Barron. The natural vegetation is fairly dense but not heavy, consisting of stunted gums, bloodwood, box, ironbark, and ironwood; the grasses are mostly kangaroo, spear, and blady grass. The rainfall is moderate, most of which falls in the summer months. Though there are several types of soil in the district, four are distinct, the others being variations of these. In order of importance these types are—

(1) A grey sandy soil with a light-yellow sandy subsoil.

(2) A brown sandy soil.

(3) A red sandy to sandy loam.

(4) A white sand.

The soils are derived mostly from acid volcanic rocks such as granite and gneiss, while some of the red soils owe their origin to ferruginous metamorphic rocks. These red soils are finer grained than those derived from the granitic rocks and contain a higher percentage of silt and clay. The soils derived from granite and allied rocks are light in colour, fairly coarse grained, and infertile. The top soil has a depth of 8 to 12 inches, sometimes deeper, and merges into a sandy subsoil usually yellowish, though sometimes light grey in colour.

The mechanical analyses of these soils reveal upwards of 90 per cent. of sand with only about 3 per cent. silt and 2 per cent. clay. They are classified therefore as sands. In comparison with typical soils of the more important tobacco districts of the United States of America, these Mareeba soils are lighter. Analyses of North Carolina soils, for example, indicate that they contain from 70 to 80 per cent. of sand with 20 to 30 per cent. of silt and clay and are classified as sandy loams. In other words, they have more body. A sandy soil, particularly one of coarse texture, that carries only a small amount of silt and clay is not a very desirable type for several reasons. It is usually very infertile, has a poor water-holding capacity, and on account of its porosity water-soluble fertilizers added to it are readily leached out and lost during periods of wet weather. Such soils, too, are deficient in humus, which is an important soil constituent, influencing in a large degree the growth of the plant and the quality of the leaf.

The mechanical analyses of the subsoils closely follow those of the surface soils, showing a high percentage of sand, mostly of the coarse fraction, but slightly higher percentage of silt and clay, though these two are still relatively low.

There are in Mareeba areas of grey sandy soils whose physical composition closely approximates that of the American soils mentioned. Their silt and clay fractions together make up about 20 per cent. of their composition. They are more retentive of moisture and soluble plantfoods and produce a good yield of high quality tobacco.

The red soils owe their colour to the high percentage of iron oxide they contain. There are two types of red soil in Mareeba—a sandy infertile type formed from ferruginous metamorphic rocks; and a finer

grained, heavier, more fertile type formed from intermediate volcanic rocks such as andesites and diorites. This latter type is a sandy loam containing fair percentages of silt and clay, and its fertility permits of a crop being grown with the application of only a small quantity of fertilizer.

The white sandy soils are invariably coarse and infertile. They have no body and very poor water-holding capacity. Though these soils produce a bright leaf the yield usually is low for the large quantity of fertilizer that must be added to them; the leaf is thin and "papery," and consequently the return is not very profitable. They are formed *in situ* in elevated positions and are distinct from the light-coloured soils, usually small in extent, that occur near the bottom of ridges where there is a seepage or a poor drainage which has brought about the leaching-out of the organic matter.

The chemical analyses of most of the soils of the Mareeba district reveal that they are infertile and lacking in all the principal plantfoods and humus. Such, of course, is a feature of practically all bright tobacco soils, in which the fertility or amount of available plantfood must be limited and supplied in proportions that will give rise to a leaf possessing the desired qualities.

Dimbulah.

Much attention has been focussed on Dimbulah over the last few years on account of the large percentage of good quality leaf which has been produced there. This district, about 30 miles west of Mareeba, is mostly undulating country of sandy ridges. The country is drained by the Walsh River and several creeks. There are four main types of soil, all of which are tried for tobacco cultivation—

(1) A grey sandy soil.

(2) A light-brown to light-red sandy soil.

(3) A white sand.

(4) An alluvial sandy loam.

The soils are derived principally from granitic rocks. The grey sand is similar in mechanical analysis to the same type of the Mareeba district, being fairly coarse in texture with little silt and clay. It is usually underlain by a yellowish coarse sandy subsoil. In one area at Dimbulah is a grey sandy soil of lighter colour and texture, consisting mostly of fine sand with about 5 per cent. of clay. This area grows a good quality leaf but is not well elevated and mostly requires artificial drainage.

The light-brown sandy soils have a wide range. They are nearly always found on elevated sites that are well drained, and the type is much sought after. They are soils with a fair body, too, having up to 10 per cent. of clay and silt and the sand fraction, mostly fine. They are fairly retentive of moisture, and the humus content, though not high, is greater than the other types.

The white sands are not cultivated extensively. They are very infertile, coarse in texture, and practically devoid of humus.

The alluvial sandy loams occur on the flood plains of the Walsh River. They are the most fertile soils in the district, and consist largely of fine sand and silt. The humus content is fair. The leaf produced on these soils is mostly bright mahogany, with good body and texture.

The chemical analyses of the Dimbulah soils are, in general, similar to the corresponding types of the Mareeba district. They are deficient in all the principal plantfoods and in humus.

Hervey's Range.

In the Hervey's Range district, near Townsville, the soils consist largely of coarse sand. This, in itself, would be a defect were it not ameliorated by fairly high percentages of silt and clay, which in this instance is the case, giving the soil binding properties and adding to its water-retaining facilities. The country is elevated and surrounded by rocky ridges.

Woodstock.

At Woodstock, also near Townsville, are patches of sandy soil being used for tobacco cultivation. They are mostly grey medium-textured sands with fair humus content.

Charters Towers.

At Charters Towers the soil is of medium texture with low percentages of the fine fractions.

Bowen.

At Bowen tobacco is grown on fairly fertile alluvial soils at the delta of the Don River. On virgin soils the crop is grown without fertilizer, and some heavy yields have been recorded. The humus and nitrogen contents of these soils are fairly good. They are dark-grey and brown in colour. The mechanical analyses show high percentages of fine sand, but a low amount of the other five fractions. Soils from other parts of the Bowen district are mostly coarse sands.

Sarina.

The soils cultivated in the Sarina district, 20 miles south of Mackay, are grey and light-brown sands. Around Mount Chelona are brown and greyish soils on poor, coarse, sandy, and gravelly ridges. Similar in nature to these are the Blue Mountain soils near the coast.

Beerburrum.

Recently a large area of country has been opened at Beerburrum for extensive tobacco cultivation. Previously small crops grown in this area had produced leaf of high quality, indicating that conditions there appeared to be eminently suitable for the cultivation of bright tobacco. The topography of the country is made up of broad, gently sloping ridges of sandy soil draining off into swamps and creeks. The soils are derived from sandstones of marine origin. The most prominent type is a grey sand with a yellow sandy subsoil, the top soil having a depth of about 8 inches. It is a fine to a medium-textured sand with small amounts of silt and clay, though these fractions are, on the average, higher than in most of our bright tobacco soils. The humus content, on an average, is also higher, in this instance approaching the "fair" grade for sandy soils, and it is to this property of the soil that the high quality manifested by much of the Beerburrum leaf can probably be ascribed.

One other prominent type of soil in this district is a red sand and sandy loam. It occurs mostly in the Glass House Mountains area on elevated sites such as the crest of ridges. It is underlain either by a red sandy clay or clayey subsoil.

Park Ridge.

The soils of the Park Ridge area, about 20 miles from Brisbane, are similar in many respects to the Beerburrum soils. The main type is a grey sand underlain by a yellow sandy subsoil. The ridges are broad and elevated, draining off mostly into ti-tree swamps. The virgin soils have a fair humus and nitrogen content.

Texas.

In the Texas district, which is situated on the Southern border of the State along the Dumaresq River, tobacco has been cultivated for a number of years. The crop is grown under irrigation on flat country bordering the banks of the river. The type of soil most extensively cultivated is an alluvial loam and, being fairly fertile, a high yield is obtained without the aid of artificial fertilizer. This is not generally considered the best type of soil for growing tobacco, but it represents the character of the soil on which most of the tobacco is grown in this part of the State. Latterly, development has been down the river and about Yelarbon, where the soil is of a lighter type—a sandy loam—on which bright and fairly good quality leaf has been produced. Fertilizers are being used to advantage on some of these areas.

At Inglewood the soils are similar to those of Texas.

Summary.

Summing up, the soils of all our bright tobacco areas are, in general, infertile sands derived principally from granites and sandstones. They are deficient in all the mineral plantfoods and in humus. Tobacco is an exhaustive crop and requires fairly large quantities of the principal plantfoods. With an insufficient supply of any one, the plant readily responds to the deficiency with deleterious effects on the quality of the leaf. The plantfoods can be readily supplied in the form of artificial fertilizers, but the humus is a more difficult problem. The greatest defect of most of our tobacco soils is their deficiency of humus. What little the virgin soil contains is depleted considerably after a few crops have been removed. Green crops must then be grown and ploughed under to replenish the supply, and the practice repeated, if possible, after the removal of each crop.

Most of the tobacco soils so far analysed are slightly acid. This state of slight acidity is considered by authorities to be the optimum for the production of good quality leaf. Experiences in Queensland, however, are not exhaustive enough to enable us to draw conclusions as to the influence of soil acidity on the quality of the leaf. Each of our principal districts has produced some good leaf, which often has certain specific qualities, particularly with regard to aroma, which distinguish it. Each district has possibilities, but in order to get the best results a careful study of the soil and its treatment must be made. In order that the patient work of collecting data might not be hampered co-operative action between farmers and the Department is essential, for there is much to be learned before we can hope to produce consistently good quality leaf.

Problems of Wheat Production.

By R. E SOUTTER, Wheat Breeder, and Manager, State Farm, Bungeworgorai.

THESE notes, although presented under the title of "Problems of Wheat Production," deal with soil erosion, a subject which concerns not only the wheatgrower, but every individual who directly or indirectly depends upon the products of the soil for his or her livelihood. So calamitous have the effects of soil erosion been in the United States of America, that it is calculated thirty million acres of first-class agricultural land have been rendered worthless, and an additional sixty to seventy million acres have been so seriously affected as to be nearly worthless. The same rapid deterioration due to the same agency is going on in most countries of the world, but more rapidly in those countries where the rainfall is at times torrential. These forces of destruction are at work in our own State, and there are many areas in the coastal belt which, after having been cleared of timber, in a comparatively short period have had their producing capacity so reduced by this cause as to be only fit for grazing, and even for this purpose their value is depreciating yearly.

Fortunately, it is possible to prevent this calamity, which it undoubtedly is, and still utilise the land for ordinary agricultural purposes, and that is by making contour drains. This system of preventing erosion has been practised in the United States of America for some considerable period with remarkable results. Coming nearer home, the New South Wales Department of Agriculture was quick to recognise its potentialities and gave practical demonstrations in several sections of that State, with the result that many private individuals have practised it, and so successfully in most instances that the area being dealt with is increasing each year.

During a recent visit to the mother State, I had the opportunity of inspecting areas which had been dealt with in this way at the Wagga and Cowra Experiment Farms. It was at Cowra, I understand, where this system was first tried, and in one location was so successful as to render a dam useless by causing the water to percolate instead of running off.

The following has been taken from an article on the subject supplied to me by the compiler, Mr. Kelly, Manager of Cowra Experiment Farm, New South Wales:—

Surface draining as a means of preventing erosion by controlling the water flow in the paddocks is by no means new, but owing to wrong methods the work done in many instances has not only proved fruitless, but has rather accentuated the injury it was attempting to control. In some cases this has been occasioned by the drains not being large enough, and in other cases through relying on the judgment of the eye to run out a drain. This latter method is the surest way to court failure. The old fallacy that ploughing in channels will arrest erosion has long since been exploded. Results can only follow a determined attack on the cause of the trouble. If paddocks have been eroded badly, the matter of restoration is both lengthy and costly.

Experience in America and at Cowra Experiment Farm has shown that the only successful and practical method of dealing with soil erosion is by terrace farming or the adoption of broad-base contour drains. By the latter is meant a banking of earth to arrest the flow of surplus water with a wide sloping drain on the upper side of the bank to collect the water and convey it to a suitable outlet. The gradual slope permits of the maximum absorption and reduces to a minimum, erosion of the drain itself.

The banks vary from 1 to 2 feet in height, 10 feet in width, and with the open drain of the same width. The banks should be of such a height and nature as to admit of the passage of teams across them so that there will not be any uncropped land, or idle ground for weed propagation.

Select a road, permanent pasture paddock or natural watercourse as the outlet for the drain if possible. If such are not available, a wide drain will of necessity have to be made, and the laying-down of this with lucerne or some other permanent crop will prevent erosion here. As the desire is to carry off the surplus water as slowly as possible, there are three points of paramount importance.

(1) That the correct *grade* be obtained in constructing the drain.
(2) That the drain and bank be of ample proportions.
(3) That the distance between the contour drains be kept in direct accordance with the area and slope of the land to be drained.

Dealing with the first point—*Grade*—experience has shown that a fall of 1 inch in 16 feet 8 inches (or 1 in 200) will give the requisite grade to carry water slowly and without damage to the drain, all things being equal. With the home-made level to be described later, the correct fall is automatically obtained.

With regard to the second point—*Capacity of drain* and dimensions of bank—this will be governed by—

(*a*) Area which the drain has to cater for.
(*b*) Slope of the area.
(*c*) Type of soil.
(*d*) Length of drain.

The further the drains are apart the greater the dimensions must be of the contour drains. The greater the slope the greater will be the velocity of the surface water over the terrace and in the drain, therefore the latter must be sufficiently large to hold and convey the water received.

The type of soil will have an influence; sandy soils and light loams absorb water much more rapidly than clay soils, therefore the latter will give a greater run-off, which necessitates the consideration of this aspect when laying out contour drains.

The longer the drain the greater the accumulation of water, and consequently increased capacity should be allowed for in the construction of it. Where possible the drains should not be long, for the shorter they are the less likelihood of the water breaking over them. As regards the point of ratio of surface to be drained and size of drain, the size of drain and height of bank have certain limitations due to several factors such as machinery available for construction and the working of cultural implements over the banks.

We now come to the third point—*Distance between the contour drains*—which will be decided by the slope of the land. This can be gauged by using a straight edge, 16 feet 8 inches in length. Place one end on the ground on the uphill side, and placing a spirit-level on the centre, raise the lower end of the straight edge until it shows level. Six times the distance from the ground to the raised end of the straight edge gives the fall in 100 feet. Generally a vertical distance of 9 feet between drains will prove satisfactory with minor alterations to suit peculiar conditions which exert a controlling influence. (This vertical distance would, in all probability, be far too great for Queensland.)

With a slope of up to 6 per cent. drains three chains apart have proved satisfactory, but with a greater slope they require to be correspondingly closer. Consideration must be given to any accumulation of water from grass paddocks or other sources on adjacent higher land.

Taking Levels.

For all practical purposes, accurate and satisfactory results will follow the use of the home-made level, which is made as follows:—

Of Oregon pine, 5 or 6 by 1, obtain one 8-foot length for upper stay, one 11-foot length for centre stay, on which rests the spirit-level, and two pieces 7 feet 6 inches long for the legs. Mark out on a floor or other level surface an isosceles triangle having a base 16 feet 8 inches long with sides 11 feet. Lay legs along side, keeping mark on the inside and allowing sufficient projection at base to cut on bevel. Next lay 8-foot piece across narrow end, allowing sufficient overhang to enable both legs and top stay to be cut flush, and nail securely. Place the other stay across, allowing sufficient projection at either end to cut flush with edges of legs, and nail one end. Stand upright and place spirit-level on centre stay and when it shows level make secure. If any doubt exists as to the floor or surface used being level, the following method can be adopted:—

Drive two pegs 16 feet 8 inches apart in the water at the edge of a dam so that the top of each peg is just level with the surface, then test. When proved correct, at each intersection bolt with two bolts. When these have been tightened up, test again, and if found level, cut an inch off one leg, and mark it upper. A frame for holding the spirit-level in position on centre stay whilst moving about will be found to save a good deal of inconvenience.

Before taking any levels make a detailed inspection of the area to be dealt with, which should afford some idea as to the volume of water to be catered for. The next thing is to decide as to the best place for the outlet. At times it is necessary to have central and intermediate channels for the final disposal of the water accumulated by the drain.

Drain-making should commence at the highest end of the paddock, for if started at the lower end and rain is experienced before the work is completed the drains made would not be capable of dealing with the run-off.

With the home-made level, pegs, and other equipment a start is made on the top drain from where it has been decided to have its exit. Place the long leg of the frame or level at this point and use as a pivot for moving the shorter leg backwards and forwards until the spirit-level shows level, then drive a peg in where the short leg rests; next move

the frame along until the long or lower leg rests alongside this peg and use as a pivot as before, and when level shows level insert another peg, and repeat until the other side of the paddock has been reached.

In view of the fact that one leg of the frame is 1 inch shorter than the other, the result will be a fall of 6 inches in 100 feet, or a half per cent.

As the ground varies in slope the drains will be found to wind a good deal and a number of sharp small bends will also be observed. These latter are due to minor depressions or rises and can be ignored when constructing.

The marked position of the drain having been defined, the construction can now be commenced, for which the following implements can be used, viz.:—

(1) Disc plough.
(2) Disc plough in conjunction with grader or delver.
(3) Mouldboard plough in conjunction with grader or delver.
(4) Grader or delver.

Of these the disc multiple-furrow plough is probably the most economical and as efficient as any to use. If available, a single furrow can be used to strike out along the line of pegs, throwing the sod downhill, which will give a good line for the multiple-furrow disc to follow as well as leave the pegs uncovered. With the disc plough the first furrows should be thrown uphill, allowing the front wheel to run in the furrow left by the single plough and backing this up from the upper side and so form a ridge in the centre, and continue in this way for three or four rounds according to whether the plough is a five or a four furrow. Strike out again at centre and continue for three or four rounds; then again strike out at centre and back up again for three or four rounds, according to number of discs. This procedure should normally provide a bank of sufficient height and a drain on the upper side capable of carrying off the water.

The running of an additional trip along the top side of the drain with the rear furrow very shallow will give the top side a gentle slope and also produce a certain amount of loose earth which can be worked over the bottom of the drain.

To level and finish off a spring-tooth cultivator should be run along the drain and the ploughing on either side of the bank. This operation not only consolidates the soil, but the tracks lead the water along the drain, and in addition a certain amount of good soil is spread along it and so ensures a better crop growth.

If a paddock has been scoured prior to putting in the drains, it will be found that in some places the banks will be too low and so will have to be raised and strengthened in order to prevent water breaking over, and to do this an earth scoop will be found most suitable. Stubble land is in the best condition for draining, as the passing to and fro of the teams and implements, &c., have consolidated and levelled the surface to such an extent as to render the surveying for the drain a very simple matter; nevertheless, well-settled fallow can be dealt with satisfactorily.

The first ploughing after draining should be along the line of contour to avoid crossing the drains, but after the banks have become consolidated it can be done in any direction.

Finally, never let the efficiency of the drains or banks become impaired or very serious damage may be the result.

Wheatgrowing in the Maranoa.

By R. E. SOUTTER, Wheat Breeder, and Manager, State Farm, Bungeworgorai.

QUEENSLAND, although not looked upon as a wheat-growing State, produces sufficient to meet her own requirements, and has the second highest average yield per acre in the Commonwealth, 15·18 bushels—being beaten by Tasmania with 21·78 bushels. With the adoption of a cultural system which has for its objective the conservation of moisture the discrepancy between these two averages can be reduced, seeing that varieties with increased rust resistance and ability to produce grain under adverse conditions have been evolved and are being improved upon.

Even in the more favoured districts of the Darling Downs, where the meteorological conditions are such that fair to good crops are obtained nearly every season, the practice of the short fallow would tend to raise the average, whereas in the Maranoa, where the rainfall is less, the adoption of the long fallow in conjunction with the short fallow is considered essential to success. That success can be looked for, will be gathered from the fact that in 1918 a 30-acre paddock worked on the long fallow sown to "Warren" wheat in May and harvested in October gave a return of slightly over 24 bushels to the acre, on a rainfall during the growing period of 1·96 inches. The yield obtained on the short fallowed section was 17 bushels.

During the 1931 season, the rainfall from May until the crops were ready for harvesting (October), was 3·71 inches; the yield from a small long-fallowed section was 24·4 bushels per acre, whereas the short fallowed portion gave a return of 16·5 bushels.

The average yield obtained on the short fallow over a period of seventeen years is 17·1 bushels, the average for the district over the same period being in the vicinity of 8 bushels.

That the yields just previously mentioned were the result, not of the rain which fell during the growing period, but of that which had been previously conserved in the soil, may be gathered from the fact that, according to recognised authorities, to produce, say, 15 bushels of wheat 4½ inches of water are required to pass through the crop, and for every extra 10 bushels 3 inches more are necessary. To produce the crop of 24 bushels in 1918 nearly 7¾ inches of water would be required. So, even supposing that all the rainfall (1·96 inches) was available to the crop (which it was not) it was necessary for the moisture content of the soil to be sufficiently high to permit of approximately 5 inches being furnished to the plants.

A glance at any rainfall chart will serve to show that in Queensland the season of the greatest precipitation occurs during the summer months when the weed growth is exceptional and evaporation greatest, and it follows that this must most assuredly be the season of greatest cultural activity so that the moisture may be trapped and conserved for the future crop's requirements.

What operation to carry out, and when, cannot be stated definitely, as experiments carried out to determine same only emphasise the fact that no hard-and-fast rules can be laid down, there being so many controlling factors, and it remains with the individual who is aware of the peculiarities of his case, and who should be armed with the knowledge which will enable him to surmount them.

Long and Short Fallows.

The difference between a long and short fallow is that in the former case the land is cropped every second year with wheat, and in the interim is worked so that the maximum amount of water possible from the rain experienced is retained in the soil; whereas the short fallow is cropped again the following year, cultural operations having immediately followed harvesting operations and continued until sowing time. With the adoption of the long and short fallow on a wheat farm, it is necessary to subdivide the area it is intended to crop into three sections; two of which will be sown the first year (short fallow), the other kept worked and sown as the long fallow quota in the following season. In the second year one of the two sown the previous year will again be sown (short fallow), and the other reserved for sowing next season (long fallow).

From the foregoing it will be seen that two-thirds of the area is cropped every year, half of which is on a long and half on a short fallow after the first year. At the Roma State Farm the *modus operandi* in connection with the short fallow, likewise the initial stages of the long fallow, is to commence cultural operations as soon as possible after the grain has been harvested.

If the soil is too dry for ploughing, the disc cultivator is run over it, with the result that the stubble is broken down (we seldom get a burn), weeds are checked and the surface is broken, which lets the rain in when it comes. To all appearances, sometimes very little good is being accomplished, nevertheless it is surprising how much longer ground treated in this way remains in good ploughing condition than if it were neglected.

Ploughing.

As soon as the land is in a fit condition to carry a team without injury after rain has fallen, ploughing should be gone on with. This does not necessarily apply to the land already disced, for, as stated before, this land will remain in good ploughing condition for some time longer than unploughed land.

Now good cultural methods in connection with wheat production at one time were considered to necessitate deep ploughing, but this has been shown to be a fallacy. Not only is it not essential, but it may at times be detrimental for, in our experience, when the work has been done late in the season, or when the conditions following have been unfavourable to consolidation, it has proved injurious and in seasons of very limited rainfall has resulted in failure.

The depth looked upon as giving the best results on most classes of soil is in the vicinity of 5 inches, which depth when worked up provides a good mulch and seed bed, and at the same time forms a fairly large reservoir for water should heavy rains be experienced, an essential on soils of slow percolocity.

After the initial operation of ploughing has been completed, the inverted soil is permitted to lie in the rough state for five or six weeks, or until sufficient rain falls to mellow it, so that heavy harrows will bring it to the desired tilth. All subsequent work must be in the direction of preventing the formation of a hard crust and weeds from growing, both of which tend to nullify the results of operations already carried out for the retention of moisture. This means that as soon after rain as possible it is imperative that the soil mulch, which will have been rendered ineffective, be restored.

Restoring Surface Mulch.

The implement to use for this purpose will depend on those available, but as a rule harrows, spring tooth, and a one-way cultivator are found on most farms, one of which will be capable of dealing effectively with any condition of the soil towards the restoration of the mulch.

Should the soil be of a good mechanical condition and not weedy the ordinary harrows will prove effective; whereas if it is weedy and the surface has set the one-way cultivator will have to be brought into use. If the ground is clean but set too firmly to respond to the harrows, the tooth cultivator is the best, for the reason that it does not reduce the mulch to the same state of fineness as the harrow. Whichever implement is used, the operation of restoring the soil mulch should not be attempted before the soil is in a condition to respond fully to the treatment, that is, when it is in its most friable state.

Depth of Mulch.

As a result of observations made on most classes of soils in many parts of Australia, it is considered by those in a position to know that from 2½ to 3 inches is the most economical depth. Anything shallower would not be effective, and a greater depth more costly in proportion to increase in effectiveness.

Depth of Sowing.

From 2 to 2½ inches is considered to be the most suitable depth to sow, although deeper sowing is sometimes practised on light soils to ensure germination; but even at 2½ inches on clayey loams, similar to those at the Roma State Farm, many plants would fail to reach the surface should heavy rain fall immediately after seeding, more particularly if other than graded seed had been sown.

Rate of Sowing.

This is governed by the variety and season of sowing, but as a general rule 30 to 35 lb. to the acre will suffice for early and mid-season (April to third week in May), whereas 40 to 50 lb. to the acre will be necessary on areas sown later.

Direction of Sowing.

All cultural operations carried out in the latter part of the season should be at right angles to that which it is intended to sow to ensure that all seed is well covered and germinates evenly. Otherwise where the drill runs in the same direction as a plough finish, a portion of the grain is just covered or left lying on the surface, with the result that it does not germinate until rain occurs, which, delayed for any length of time, causes unequal ripening, thereby hampering harvesting operations or affecting quality of grain.

Varieties.

On the sowing of suitable varieties depends the ultimate success of all a farmer's cultural operations.

Of the new wheats evolved and which have come into general cultivation, the bulk are very much earlier than their predecessors of some years ago, due to the fact that their earliness very often enables them to escape rust; and at other times in seasons of limited rainfall to produce grain under conditions practically fatal to slow-growing kinds.

This earliness, in conjunction with indiscriminate sowing, is no doubt a contributing factor to the extra damage done when late frosts are experienced. In an endeavour to mitigate this to some extent, the season for sowing those varieties grown most extensively in the Maranoa will be given.

Variety.	When to Sow for Grain.	Rate in lb. per acre for Graded Seed.
Amby .. Cleveland	End of April to end of May (second week)	30 lb. per acre
Currawa Warchief Warren	Good varieties to sow on locations subject to late frosts	30 lb. per acre
Bunge .. Cedric ..	May and June	May (first and second week), 30 lb.
Clarendon Gluyas .. Nabawa	May and June	May (third and fourth week), 40 lb.
Novo .. Reward Three Seas	May and June	June, 50 lb.
Flora .. Florence Watchman	From May (second week) ..	May, 40 lb. June, 50 lb.

Reward, which is a small, shotty red-grained wheat, had better be sown at a rate of 5 lb. to the acre less than the others.

The foregoing has not been designed for the low-lying lands adjacent to creeks, which are susceptible to heavy and late frosts, so it will be necessary for the individual farmer to make allowances. From the varieties he has previously grown, he will probably decide that those in No. 1 can be sown early in May, No. 2 after the second week, and No. 3 in June.

Harrowing the Crop.

This should be carried out after rain, across the drills, when the plants have a firm hold in the soil and as soon as the soil will carry a team satisfactory.

This operation, which results in a loosening of the surface, preventing evaporation and leaving it in the best condition for the reception of more, also retards the growths of weed seedlings, induces deep rooting and possibly increased tillage.

Deficiency of Winter Feeding on Natural Pastures.

By J. L. HODGE, Instructor in Sheep and Wool.*

IT would appear from current press reports and letters received from graziers by the Department of Agriculture and Stock that at last stockmasters are waking up to the fact that natural grasses in winter time are, on a great many properties, insufficient to maintain health in sheep, and especially lambing ewes and weaners. From as far out as Winton and Longreach information has reached this office of a feed deficiency in the winter months even on the Mitchell grass plains when apparently grass is plentiful. This, I think, may be attributed to constant stocking with sheep over a comparatively great number of years and insufficient care on the part of those in charge of properties in the matter of systematic spelling of paddocks with the idea of allowing the indigenous grasses to seed.

A few years ago, comparatively, it was difficult to convince some graziers that their sheep were suffering from malnutrition during the winter months. To the inexperienced eye there was plenty of feed, and it was not recognised that the better and softer indigenous grasses had, to some extent, disappeared. The idea of semi-starvation was not generally accepted. It is admitted that the conditions as described apply more to the pastures closer in, where the stocking with sheep has been of longer duration and heavier stocking has been the more common practice.

The question naturally arises as to what should be done to remedy this state of affairs. For the far-west and central districts, it would appear essential that a proportion of the run should be allowed to seed each year. This does not mean that the grazier would entirely lose the benefit of that country. Sheep could be depastured after the grasses have matured and the seed has fallen.

Overstocking should be generally discouraged and every effort made, having due regard for economy, to get the property back into "good heart." If the grazier would realise that, over a period of years, it was to his financial benefit to stock comparatively lightly, we would hear less of the evils of winter grass deficiency. Subdivision of the country would certainly help in the regrassing of the run where the cost of fencing is not prohibitive. The full advantage to be gained from spelling paddocks in rotation is then easily assured. At the present time regrassing is impracticable. It would therefore appear, to a great extent, that the question of better winter pastures is in the hands of the graziers themselves.

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* In a broadcast address from Radio Station 4QG.

The Value of Suitable Licks.

The grazier may help the stock through the trying winter months by supplying a suitable lick. It has been found that the addition of a protein is useful and profitable for the purpose.

I recommend the following:—

	Parts.
Nauru phosphate (finely ground)	40
Salt (butcher's quality)	40
Sulphate of iron	4
Epsom salts	4
Linseed meal, cotton meal, maize meal	12
	100

Here you have phosphoric acid necessary to all animal life, a necessity in salt, a tonic in the iron sulphate, a laxative in the epsom salts, and the protein recommended in the meal. The lick may be given with safety all the year round, if necessary, to dry sheep, but a great proportion of the salt should be taken out of the lick if it is proposed to supply ewes half way through the period of gestation. This is recommended on account of the fact that with the meal added the ewe is likely to take too much salt with ill-results.

Deficient Pastures on the Darling Downs.

On the Darling Downs the overstocking of natural pastures applies to an even greater extent than on far-out areas.

The holdings are very much smaller and have carried sheep for a longer period and, in addition, it must be admitted that the practice of overstocking has been more common, to the detriment of the indigenous grasses.

On the Darling Downs a greater opportunity exists to do something useful in the way of pasture improvement, as apart from ordinary cultivation. The Department of Agriculture and Stock has initiated an experiment there with the idea of trying out, in a practical way, certain grasses and clovers for winter feeding. We feel that something useful will result, and full information will be published in due course.

Winter Crops for Sheep.

Cultivation of small areas on the Darling Downs must come into general practice if sheep, and especially fat lambs, are to be raised profitably. Wheat, barley, and oats are all recommended. They are excellent crops for the winter feeding of sheep, and there is, of course, the prospect of a cereal crop. Lucerne cannot be too highly spoken of. Taken all round, there is no better sheep feed grown, and it is surprising where it does grow.

All farmers grazing sheep are advised to sow Rhodes grass on newly-cleared scrub land. The grass has been proved to do well on this class of country, and is a great feed both for sheep and cattle. The farmer growing wheat is losing some of his legitimate profit if he does not run some sheep. Even if breeding is not practicable, sheep acquired as stores are a necessity in most seasons for the good of the crop itself. Wheat lends itself splendidly to the fattening of old sheep, which would

be a hopeless proposition on natural winter pastures. This fact itself should be a great inducement, if such be needed, to farmers to provide adequately for their sheep in the matter of feed during the winter.

The costs of the Downs lands being what they are make it essential, if a fair return on capital outlay is to be obtained, that the farmer should get more out of his land without impoverishing it than can be yielded from indigenous pastures. Everyone engaged in dairying admits this, and the same applies when running sheep.

Cultivation and Fat Lamb Raising.

The Department of Agriculture and Stock has commenced an experiment in fat lamb raising with the idea of finding out the best crosses for the raising of fat lambs, both for home consumption and export.

In every case where English type rams have been loaned to farmers under the scheme a certain amount of cultivation has been insisted upon, it being recognised that the raising of early maturing fat lambs on natural pastures is not to be recommended. It is believed that the results will go far, not only to demonstrate the crosses wanted, but to prove to farmers on the Downs the economic necessity of winter feeding. All engaged in the fat lamb industry should realise early that the lamb must follow the plough. Another point of material importance is the loss in weight of wool in a poorly-fed sheep, in comparison with one properly nourished. It is safe to say that two adequately fed sheep will yield more to the grower than three half-fed animals.

The question of internal parasites in sheep is of no small importance when proper nutriment is under discussion. A well-fed sheep is far more resistant to this pest, and it is able to stand and responds much more readily to the necessary treatment.

From every point of view it pays the farmer to make the necessary provision for adequately feeding his stock during the winter.

We may regard ourselves as fortunate, in comparison with other countries, in that winter housing of stock is not necessary under our genial climatic conditions.

DROUGHT FEEDING OF SHEEP.

In spite of the fact that it is generally held that a sheep must have bulk to accommodate its large digestive organs, it is interesting to speculate, pointed out the officers supervising a drought-feeding trial with sheep at Hawkesbury Agricultural College in their report, how far the lack of bulk (which consumes in its digestion an amount of energy disproportionately high to the value extracted from it) is responsible for the good results shown by a ration of 12 oz. of maize, and the relatively poor results from rations in which the basic 4 oz. of maize was supplemented by roughages of low fat and high fibre content (oaten hay and mixed oaten and lucerne hay).

The indications are that when sheep are on a maintenance or sub-maintenance ration the conservation of muscular energy (by confinement to a relatively small area) becomes an important point, and is a natural corollary of conservation of digestive energy (by minimising the fibrous content of the ration). Such a procedure would be limited in practice by the possible incidence of worm infestation consequent upon fouling of the ground, but it would be reasonable to expect better results by concentrating sheep in handy 50 or 100-acre paddocks, changing as frequently as possible, than by allowing them the run of large paddocks, even with the extra picking of roughage.

Pig-feeding.

By L. A. DOWNEY, H.D.A., Instructor in Pig Raising.

[PART I.]

The subject of animal nutrition is a very complex one, and while there is a vast amount of data on the subject, and there are many useful scientific publications, Queensland pig raisers are still in need of information in a simple form, telling how scientific findings can be put into practical use on the farm. An endeavour has been made by Mr. Downey in these notes on pig-feeding to give the farmer a little clearer insight to this important subject and to avoid technicalities as far as possible. Research work on nutrition is still progressing, and, consequently, information given now may be altered by future findings.—ED.

THE ability of pigs to make economical gains in weight is determined by their breeding, management, and feeding. Well-bred thrifty pigs that are well cared for and kept in good health will make the best use of the available foods, but at the same time the old saying that "half the breeding is in the feeding" is very true regarding pigs.

The pig is a vigorous feeder, thriving on both animal and vegetable food—in fact, preferring a mixture of both. There are very few foods which he will not relish, provided they are wholesome. Decomposed foods should not be used. The pig has a comparatively small stomach and is not able to consume large quantities of bulky foods as the cow, sheep, and horse are; therefore, while a little roughage is desirable, concentrates should predominate in a pig's ration.

In most circumstances, full feeding, either by hand or self-feeder, is a wise practice and, provided the animal receives a complete and balanced ration and the necessary exercise and is bred to the desirable type, it will produce a desirable carcass at the required weight; but if small-type pigs are being fed to bacon weights, limited feeding must be practised. While the nature and composition of a pig's food affects the proportion of fat and lean in the carcass, the inherent conformation and the environment are also important factors.

Up to the present, pigs have been kept in Australia chiefly to utilise by-products from other industries, more particularly the by-products of the dairying industry, and when such foods are available cheaply they form the basis of pig-feeding rations. While pig raising is dependent on other industries for food supplies, the selection of foods and the preparation of rations will depend almost entirely on the availability of by-products; but when pig raising is undertaken as a special business, then provision of a food supply is a different matter, and the selection of foods to be grown or purchased requires very keen attention.

No one of the foods commonly used for pigs in this country is in itself sufficient to make a satisfactory ration, and to get the best from the basic foods, the farmer should add to them other foods which will improve their capacity to produce large gains in the pigs. These added foods may be either home-grown or purchased, according to the circumstances.

The pig raiser should know what quantity of food his pigs are using to make a pound of pork, and whether the value of that pork is sufficient to pay for the food as well as labour and other charges. When foods have to be purchased, their cost must be considered as well as their feeding value and their suitability when used in combination with other foods.

Maintenance.

Food is usually given to animals with the object of producing growth, work, milk, &c., but before any of these can be produced, the animal body must be maintained,—i.e., the body heat must be kept up, waste tissue must be replaced and the necessary energy for the movement of body muscles must be supplied. Approximately half the food given to a young pig is used for maintenance before any growth can be expected; this explains why the quicker the animal is grown the greater the amount of food saved on maintenance.

The normal body temperature of pigs is between 102 deg. Fahr. and 103 deg. Fahr. This temperature must be maintained. There is a continual production of heat in the body through tissues being oxidised (burned) and there is a continual cooling of the body through evaporation and radiation from its surface. On account of its thick skin and thick layer of fat beneath the skin, the pig does not perspire freely and so must be kept cool by radiation.

The growth of young animals is dependent on a supply of food in excess of a maintenance allowance, and with pigs this is perhaps the most important object in feeding from the practical viewpoint, for, having produced the young pigs, the farmer's object is to grow them rapidly and as economically as possible.

In mature breeding stock food is used not only for maintenance, but for the production of young. After the birth of the young, the sow has to secrete milk to feed them for a couple of months. This means an extra call on her body which must be supplied with the necessary food.

The laying on of fat is nature's way of laying up a reserve of energy and heat in the animal body, and animals at any age, if supplied with sufficient food, will store fat in the body. There is, however, a greater tendency to store fat when the animal is past the early growing stage. The fat is stored in layers between the skin and the muscle in the internal cavities of the body, and intermingled within the muscle fibres. This latter is known as marbling in lean meat.

Some Definitions.

Digestion.—Digestion is the process of changes which foods undergo while they are in the digestive tract of the animal, when they are separated into the portion to be assimilated and the portion to be excreted directly.

Assimilation.—Assimilation is the absorption of the useful portion of the digested food within the body.

Nutrient.—Nutrient is a substance used in the nutrition of animals.

Digestible Nutrient.—Digestible nutrient is that part of a crude nutrient which can be assimilated by the animal.

Ration.—Ration is the quantity of food given to one animal for twenty-four hours, whether it is given in one or several feeds.

Balanced Ration.—Balanced ration is the total quantity of food, containing the various digestible nutrients in the correct proportions, given to an animal in twenty-four hours.

Maintenance Ration.—Maintenance ration is the quantity of food required by an animal for body maintenance only, for twenty-four hours.

With the exception of air, water, and sunlight, all requirements of animals come either directly or indirectly from plants, which are able to gather certain elements in the form of chemical compounds from the soil and air, and with the aid of sunlight, manufacture plant products which are later used as animal foods.

The plant obtains water from the soil through the roots, and air is taken in by the plant through the minute openings called stomates on the lower side of the leaves; nitrogen, which is an important element in plant and animal nutrition, is obtained chiefly from the soil in the form of chemical compounds known as nitrates. However, leguminous plants such as lucerne, clover, and peas carry on their roots nodules which contain nitrogen-fixing bacteria which have the power of collecting free nitrogen from the air of the soil and supplying it to their host plants. Minerals such as phosphorus, potassium, and calcium are taken up as chemical compounds from the soil by way of the roots. Water supplies hydrogen and oxygen, and some oxygen is also obtained from the carbon-dioxide of the air, as is the carbon. All these substances are necessary for plant life and having obtained the required supply of these the plant is able to manufacture its various plant compounds which build up roots, stems, leaves, flowers, and seeds. The plant foods are carried to the leaves of the plant by the sap, and the green colouring matter of the leaves (chlorophyl), together with the sunlight, act on the plant foods in such a way as to change them into substances known as starches and sugars. Some of these compounds are then further changed into more complex substances within the plant and are used to build up plant tissue, to store up reserve tissue or to produce seed. These substances, produced by the plant, are known as carbohydrates, fats, and nitrogenous compounds.

Carbohydrates.

These consist of sugar, starch, and fibre and make up the larger portions of plants; they are fat, heat, and energy producing substances of animal foods. Sugars and starches are more digestible than fibre, and in grains they are more plentiful than fibre, whereas in hay the fibre content is about equal to that of starch and sugar.

Fats and Oils.

Fats and oils are similar in composition, but fats are solid under ordinary temperatures, while oils are liquid. These compounds are mainly the reserve food supply in the seeds of plants; they are particularly plentiful in peanuts, cottonseed, and linseed. Both carbohydrates and fats are composed of hydrogen, carbon, and oxygen, but carbohydrates contain approximately two and a-quarter times more oxygen than do fats, with the result that when they are burnt (oxidised) in the animal body the fats and oils give off approximately two and a-quarter times as much heat as do carbohydrates.

Nitrogenous Compounds.

By adding nitrogen and other elements to the carbohydrates, the plant builds up substances known as nitrogenous compounds or crude proteins. This group of substances includes proteins and amides or amino acids. Proteins are largely used in the production of milk, for growth and for reproduction in animals. Young plants which have not reached maturity contain a larger proportion of protein than older plants which contain larger quantities of fibre.

PLATE 128.

Grade Large White growers on a self feeder at the Maroon Homestead Farm. They should be nicely finished when they reach bacon weights

Mineral Matter.

Mineral matter is contained in all plants in varying degrees; the younger growth of plants has a higher percentage of useful minerals than the older portions. The chief mineral elements required by the animal are calcium and phosphorus, although several others are necessary in small quantities. When stock are fed on plants containing ample quantities of the necessary minerals, there may be no need to add more minerals to the ration, but in some cases, and especially where young or pregnant animals are being fed, the addition of a mineral supplement to the ration is an advantage. Several mineral mixtures are on the market and their use is often preferable to the farmer making his own, for they are usually complete and thoroughly mixed.

Iron as a Preventive of Anæmia.—A lack of iron in the sow's milk has been proved to be the cause of anæmia in young suckers, the anæmia being indicated by a paleness in the pigs, a wrinkling of the skin, and diarrhœa. The trouble occurs from the time the pigs are born until they commence to eat solid foods. Where sows and litters are run on pasture the anæmia does not occur, as the pigs receive iron from nosing in the ground, but in intensive pens where pigs have no access to soil, trouble may be anticipated unless precautions are taken. Simple means

of prevention when litters are penned consist of giving either a supply of mineral mixture containing sulphate of iron or a quantity of fresh soil or turf in the pen where the suckers have access to it.

Vitamins.

Vitamins are substances present in foodstuffs about which knowledge is, as yet, limited. It is known, however, that the vitamins, of which there are several known varieties, are essential to health, growth, and reproduction of animals; and if any one of them is not supplied in the foods, trouble will occur in the stock. As the various vitamins are present in most of the common stock foods, there is little risk of deficiency when a good variety of foods is given, and particularly when grazing is provided.

Salt.

Salt, as well as being a necessary compound in animal nutrition, is valuable as an appetiser, and for this reason it is used as the base of most commercial mineral mixtures for stock. An excess of salt has a poisoning effect on pigs.

Water.

Water is another essential for animal health, and all stock should receive all the water they require at frequent intervals. Water takes its part in practically every body function, and a large proportion of the body is made up of water. Where animals are fed excessively on very watery foods such as separated milk, they drink very little water, if any, but when dry foods are given, large quantities of water are required by pigs.

Air and Sunlight.

Fresh air and sunlight are both necessary for health and growth in stock, and it is advisable to allow animals access to both. It is also necessary to provide exercise to maintain normal functioning of the body.

Digestibility of Foods.

Although a chemical analysis of a food shows the quantities of crude protein, fats, fibre, and nitrogen-free extract the food contains, it does not indicate the proportions of the substances which are really available to the animal for nutrition. As only a portion of each nutrient is digestible, the remainder is lost from the animal body in the excreta. The food, on being taken into the mouth, is chewed and more or less ground to a finer consistency and mixed with saliva. It then passes on to the stomach and intestines, and it is subjected to the action of the various juices which are secreted in the body; bacteria also work on the food. This process dissolves the foods into compounds, some of which are then ready for assimilation.

Food nutrients are digestible to varying degrees, and the percentage of a nutrient that is digestible is known as its digestibility coefficient. The digestibility coefficients are determined experimentally by analysing foods, then feeding them to animals, and collecting all the excreta, which is then analysed, and the quantities of nutrients found to be left after digestion has taken place are said to be indigestible, and the differences between these quantities and the original quantities indicate what was digested by the animal. In considering the nutritive value of foods, it is the digestible nutrients that are used.

In practice the quantity of fibre in a food is a fairly good indication of its digestibility, fibre being very resistant to digestion.

Nutritive Ratio.

In calculating the nutritive value of a food, the percentage of digestible proteins, carbohydrates, and fats may be added together, after multiplying the fats by 2¼ to allow for their extra heat-producing capacity. The total is known as the total digestible nutrients.

If the sum of the digestible carbohydrates, plus fats multiplied by 2¼, be divided by the digestible proteins, the resultant ratio is known as the nutritive ratio. Different classes of stock require different nutritive ratios; for example, young growing stock and breeding animals require a greater proportion of proteins than do fattening stock.

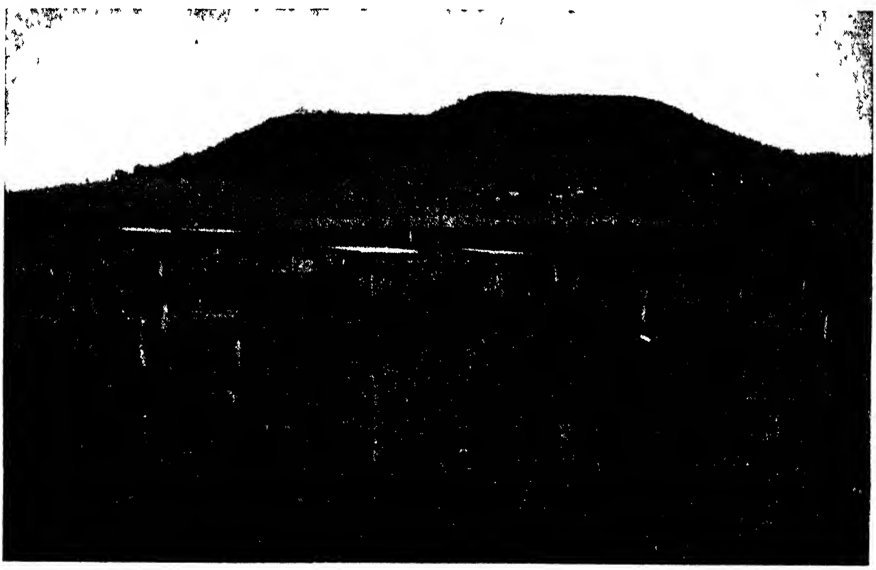

PLATE 129.
W. F. Kajewski's Piggery, Glencoe, via Gowrie Junction, where pigs are kept under grazing conditions.

The nutritive ratios of different foods vary; for example, separated milk, which is comparatively rich in proteins, has a ratio of 1 part proteins to about 1·4 parts of carbohydrates, plus fat x 2¼, and this ratio is stated as 1 : 1·4. Maize grain, which is particularly rich in carbohydrates, has a ratio of about 1 : 12.

Foods carrying a large proportion of proteins are called nitrogenous foods, and have a narrow nutritive ratio. Those carrying a large proportion of carbohydrates and fats are called carbonaceous foods, and have a wide nutritive ratio. Young growing pigs require about 20 per cent. of protein in their ration at weaning time, and by the time they are 150 lb. live weight their requirement is down to about 15 per cent. protein.

Palatability.

Foods which are pleasing to the taste of animals are said to be palatable. Palatability is affected not only by the actual composition and condition of the food, but by the custom of the animals which are being fed. For example, if pigs have been accustomed to eating maize grain on the cob, and are suddenly changed over to ground maize grain, they sometimes do not relish the change; and if the change had been reversed, this dislike would probably also have been noted. Foods which are very palatable to an animal stimulate digestion, and therefore give better results in feeding. Also, when maximum gains are desired it is wise to give a palatable food mixture to stimulate food consumption. Dry foods containing a large quantity of fibre are usually less palatable to pigs than succulent foods and good grain. When certain unpalatable foods are available cheaply and it is desired to make most use of them, the addition of some more palatable food will often increase the palatability of the ration.

Succulence.

Succulent foods, such as young growing green crops or root crops or grass pasture, are appreciated by stock, and have the additional advantage of acting as a laxative. The palatability of succulent foods increases their consumption, and so leads to greater production.

Variety.

It is important in animal feeding to give a variety of foods at all times. However, sudden changes of diet should not be made. When the animal regularly receives a good variety of foods in its ration, there is little risk of a deficiency of any of the necessary nutrients, and the ration is more palatable to the animal. Even when the feeder lacks a knowledge of the principles of feeding, if he gives the stock a sufficient variety of foods good results will usually be obtained.

Concentrates, Roughages, and Bulk.

Foods which contain a comparatively low percentage of fibre are known as concentrates. They are highly nutritious. The various grains, as well as pollard, meat meal, and linseed meal, would come under the heading of concentrates.

Roughages are foods such as fodder crops, pasture, hay, and silage, which contain a comparatively large quantity of fibre and little digestible nutrients. Foods such as root crops, pumpkins, and melons do not contain large quantities of fibre, but are watery, and for this reason are usually classed as roughages or bulky foods. Separated milk, buttermilk, whey, and soup are also classed as bulky foods as they contain a very high percentage of water, although their fibre content is nil.

Preparation of Feeding Stuffs.

Any benefit to be derived from the preparation of a food will depend on its character and condition and on the animal. With most foods cooking is unnecessary for pigs, exceptions being offal and English potatoes, also milk products which are suspected of carrying the tubercle bacillus. In cold weather pigs prefer warm food and drink, and this

should be attended to where practicable, as it will increase the palatability and help maintain the body heat, portion of which would otherwise be utilised to heat up the cold food in the digestive tract. While it is usually wise to force pigs to chew their foods, the small grains are more digestible when they are ground, crushed, or rolled, and even maize, which may be well chewed and digested at times, is often improved by grinding; although pigs, if accustomed to the method of feeding, will make economical use of maize either on the cob or as whole, shelled grain.

When the small, hard grains cannot be crushed, ground, or rolled, they should be soaked or boiled to soften. Lucerne chaff or hay is sometimes steamed or soaked to increase its palatability for pigs, although after pigs become accustomed to these foods they make good use of them dry.

Quantity of Food to Give.

The growth, appetite, and condition of the pigs are the feeder's best guide in determining quantities of food to use, but for convenience in calculation, the following may be taken as approximate requirements to produce rapid growth in pigs:—

Live Weight of Pigs.	Minimum Daily Allowance per Pig of Protein-rich Foods. Sep. Milk or Buttermilk.	or *Meat Meal, etc.	†Daily Allowance per Pig of Grain or its Equivalent.
	Gallons.	Lb.	Lb.
20 lb.	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{2}$
40 lb.	$\frac{3}{4}$	$\frac{1}{2}$	1
60 lb.	$\frac{3}{4}$	$\frac{1}{2}$	2
80 lb.	$\frac{3}{4}$	$\frac{1}{2}$	3
100 lb.	$\frac{3}{4}$	$\frac{1}{2}$	4
120 lb.	$\frac{3}{4}$	$\frac{1}{2}$	5
140 lb.	$\frac{3}{4}$	$\frac{1}{2}$	$5\frac{1}{2}$
160 lb.	$\frac{3}{4}$	$\frac{1}{2}$	6
180 lb.	$\frac{3}{4}$	$\frac{1}{2}$	$6\frac{1}{2}$
200 lb.	$\frac{3}{4}$	$\frac{1}{2}$	7
Brood Sows (Dry)	$\frac{3}{4}$	$\frac{1}{2}$	5–6
Brood Sows with Litters (over two weeks)	$1\frac{1}{2}$	1	10–12

* When a minimum of $\frac{3}{4}$ gallon of separated milk or butter-milk daily per pig is available, there should be no necessity to use meat meal or similar protein-rich foods, excepting in the case of sows with litters, which require $1\frac{1}{2}$ gallon of milk.

† When other foods are used to replace some or all of the grain allowance, it may be estimated approximately that 1 lb. of grain equals—

4 lb. Sweet Potatoes,
4 lb. English Potatoes,
5 lb. Arrowroot,
6 lb. Pumpkins,
8 lb. Mangolds,
5-10 lb. Green Pasture or Forage Crops,
1 gallon Separated Milk or Butter-milk (undiluted),
2 gallons Whey.

When pigs are receiving large quantities of protein-rich forage such as lucerne, cowpeas, or field peas, the maximum requirement of protein-rich food such as milk or meat meal will be less than shown above. It should be remembered in using bulky foods to replace grain

that pigs have a limited capacity for such foods, and better results are usually obtained by feeding at least some of the grain requirement as grain; this applies more to young pigs than to brood sows.

Good pigs which are full fed should gain an average of 1 lb. live weight daily from 20 to 100 lb. and require an average of 3½ lb. of grain equivalent to make that 1 lb. gain. From 100 to 200 lb. the average daily live weight gain should be approximately 1½ lb., with a food requirement of approximately 4½ lb. grain equivalent for each 1 lb. gain.

[TO BE CONTINUED.]

A CHEAP WINTER RUG FOR DAIRY COWS.

Where proper shelter is not provided for stock, not only is their resistance to disease reduced, but much food material is wasted in "warming the wind," or in other words meeting the increased demands of an exposed body. This fact has an important application for dairy farmers. A cow's food is only devoted to production after the animal has satisfied its needs for nourishment and heat. In assisting the cow to conserve the lastmentioned, shelter belts in the form of trees and hedges have considerable utility on the dairy farm, especially in colder districts and situations, and for the same reason the rugging of the animals during at any rate a portion of the winter is well worth while.

Many farmers would like to rug their cows, but cannot afford to purchase the market article. The farmer can, however, make his own cow rugs for little more than the cost of two or three cornsacks or other heavy bags, a ball of twine, and a sewing needle, plus his own ingenuity, points out a leaflet issued by the New South Wales Department of Agriculture. Two bags, or three for larger cows, will make an effective rug if utilised as follows:—

Split the bags down the seams and join together and place on the cow. Next cut off a strip from 10 to 18 inches wide so that the rug will not hang too low. This need not be wasted; it is folded, and when sewn to the rug provides the strap for the thighs, this being the only strap used. The front is now fitted by turning up the front corners and sewing them to the sides of the rug. This strengthens the rug and obviates the necessity for cutting off the spare portion which the cow would tread on. The two turned-back portions are then measured and sewn to fit fairly tightly to the cow's neck. The back strap is fitted 12 to 15 inches below the rump level, and the rug is complete.

This home-made rug will keep the cow warm, and after a few days' wear, when the oil, &c., from the cow's body has worked into the rug, it will also be waterproof. The rug can quite easily be slipped off and on over the cow's head, and it is advisable to remove it daily except on rainy or very bleak days. The cow's name painted on the rug over the rump with tar prevents confusion in replacing the rugs.

A trial on one or two cows will prove the efficacy of these rugs, the animals soon showing their appreciation in a practical manner.

Cockerel-raising Experiments.

Report by P. RUMBALL, Poultry Expert, and J. E. LADEWIG, B.Sc. Agric.

The White Leghorn fowl, by reason of its size and class, is not generally regarded as a table bird. In fact, as soon as chickens reach an age which enables sex to be determined, it is the general practice to destroy the cockerels. They are thus a total loss to the industry. If they could be reared economically to the "prime roaster stage," a small profit would be acceptable to the poultryman. These experiments, which were conducted at the Animal Health Station, Yeerongpilly, were designed to investigate the cost of raising cockerels on rations which can, in the main, be home-produced.

The tests were conducted with cockerels six weeks of age. One lot was reared in pens and one lot in batteries.—Ed.

PEN-REARING TESTS.

IN these tests 86 cockerels were used. They were divided into three groups of 28, 28, and 30 birds each.

These birds were reared in pens 5 ft. wide and 20 ft. long. Their liberty was considerably restricted in consequence.

Rations.

Simple rations were fed in two instances with the object of encouraging the utilisation of surplus supplies of skim milk and meals that could be made on the farm. The other ration was similar to that used by many commercial poultry farmers for the rearing of stock—

Group 1 were fed twice daily upon a ration composed of 80 per cent. maize meal and 20 per cent. semi-solid butter-milk.

Group 2 were fed twice daily a mash of 80 per cent. wheat meal and 20 per cent. semi-solid butter-milk.

Group 3 were fed upon an all-mash, which was kept constantly before the birds.

The average crude protein content of the different rations was as follows:—Group 1, 11·5 per cent.; Group 2, 14·7 per cent.; Group 3, 15 per cent.

Rate of Development.

Except during one week, fairly uniform growth was maintained in all pens up to the age of sixteen weeks; from this period onwards the

rate of development in one pen showed a marked difference, and with the object of illustrating the variation in the three pens, Table I. has been prepared:—

TABLE I.

SHOWING AGE, GROUP, AVERAGE WEIGHT OF BIRD, AND COST OF FEED PER BIRD.

Age.	Group 1. Maize and Milk.		Group 2. Wheat and Milk.		Group 3. All-Mash.	
	Weight of Bird.	Cost of Feed.	Weight of Bird.	Cost of Feed.	Weight of Bird.	Cost of Feed.
Weeks.	Oz.	d.	Oz.	d.	Oz.	d.
6 ..	17·3	..	17·1	..	17·9	..
16 ..	42·7	11·0	43·1	11·1	48·9	11·3
17 ..	46·7	12·2	47·1	12·4	55·1	12·6
18 ..	46·7	13·5	47·7	13·8	56·1	13·9
19 ..	51·6	14·9	52·6	15·6	58·2	15·1
20 ..	54·5	16·4	55·7	17·3	61·3	16·3
21 ..	55·1	17·9	56·0	18·6	60·6	17·4

From Table I. it will be noted—

1. That the birds fed on all-mash were as heavy at seventeen weeks as were those fed maize and wheat at twenty-one weeks.
2. That the cost of feeding from the age of six weeks until the cockerels attained the weight of 55 oz. was—All-mash, 12·6d.; wheat and milk, 17·3d.; maize and milk, 17·9d.
3. That the rate of development appeared to be somewhat associated with the crude protein content of the ration.

BATTERY-REARING TEST.

In this test sixty cockerels were used, penned in lots of 10.

The feeding was based upon the principle of the farmer using farm-grown and manufactured meals plus milk. In this test, as in the former, semi-solid butter-milk having a crude protein content of 20·8 per cent. was used. Approximately four times the quantity of skim milk would be necessary as a substitution for the semi-solid.

Rations.

——	Section 1.	Section 2.	Section 3.	Section 4.	Section 5.	Section 6.
Maize meal	80	40	..	60	90	..
Wheat meal	..	40	80	..	5	50
Semi-solid milk	20	20	20	40	5	50
Crude protein content of ration	11·5	13·1	14·7	13·8	9·9	17·0

In addition to the above, green chaffed lucerne was fed once daily, and shell grit, charcoal, and water were kept before the birds at all times.

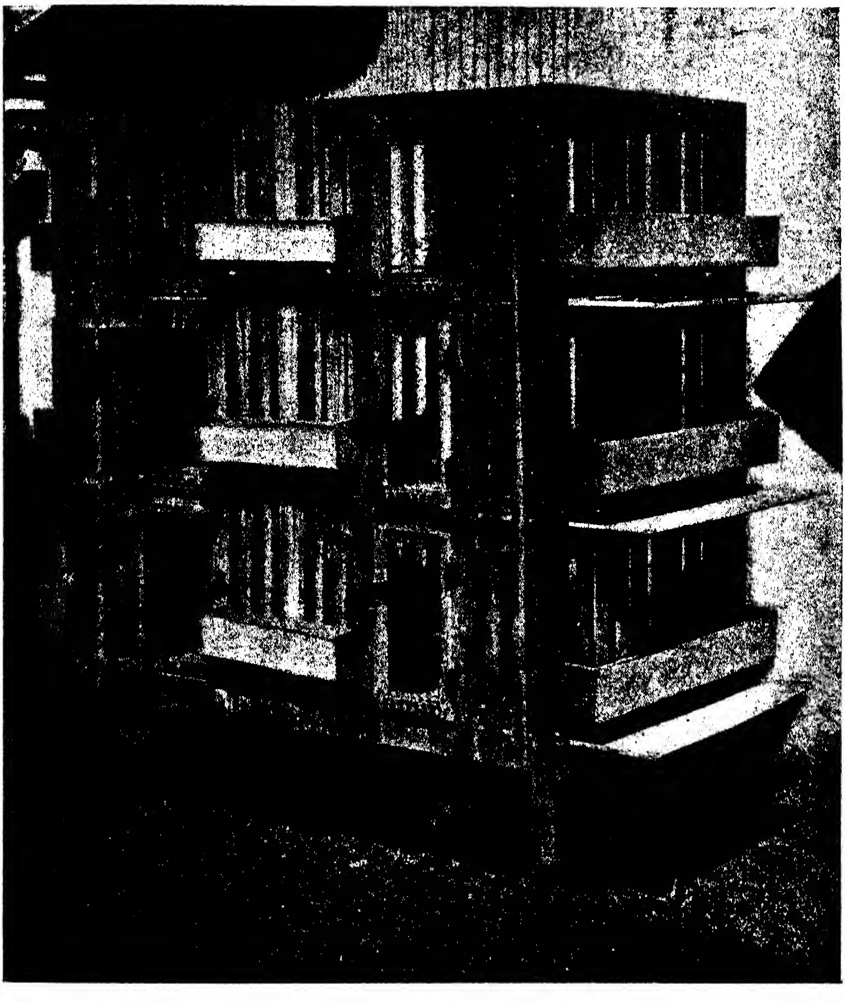

PLATE 130.

Battery used in the Cockerel-feeding Experiments, showing three decks, wire floors (with tray underneath to catch droppings), and outside feed and water vessels.

The quantity of food supplied was varied in accordance with the appetite of the birds. There appeared, however, to be a definite relationship between consumption and the butter-milk content of the ration, the rations having the higher content being favoured.

Rate of Development.

In order to indicate the progress development, Table II. has been prepared, commencing when the birds were fourteen weeks of age, as one group at this age were as heavy as the best group in the pen-rearing tests were at seventeen weeks.

TABLE II.

SHOWING AGE IN WEEKS AND WEIGHT OF BIRD IN OUNCES.

Weeks.	Section 1.	Section 2.	Section 3.	Section 4.	Section 5.	Section 6.
	Oz.	Oz.	Oz.	Oz.	Oz.	Oz.
14	40·5	39·2	38·7	49·7	37·5	56·3
15	43·2	41·2	40·5	52·0	39·3	59·6
16	46·2	43·8	44·4	55·1	43·1	63·3
17	47·0	44·2	47·0	58·2	46·0	66·3
18	49·7	43·1	47·0	58·4	48·4	66·1
19	51·4	43·7	47·3	59·3	49·7	65·9
20	53·8	50·4	49·2	61·8	52·0	66·6
21	55·2	55·7	53·3	61·7	53·1	65·4

From Table II. it will be noted that Section 6 attained the weight of 55 oz. in fourteen weeks. This ration had the highest protein content of any, and, as in the pen-rearing test, it is suggestive that rations of a relatively high protein content are more efficient for the rearing of cockerels for table purposes. This ration also contained the highest amount of butter-milk, which undoubtedly stimulated consumption.

The cockerels in Section 6 increased in weight between the ages of six and fourteen weeks by 39 oz., an average gain of nearly 5 oz. per week. During the next two weeks they put on 3 oz. per week in weight and then remained almost stationary. It appears, therefore, that the most economic stage of development is reached with this system of feeding when the bird is from 55 to 60 oz. in weight, and consequently should be disposed of at or about that weight.

The next section to reach the 55-oz. mark was Section 4. This ration had the third highest protein content, but its semi-solid milk content was twice that of Sections 1 and 3.

This additional quantity of milk undoubtedly increased consumption, with the natural consequence of more rapid development.

FINANCIAL ASPECT.

Every breeder has for his object the rapid development of cockerels for table purposes. Early development reduces the plant necessary, and the flesh of the young quick-grown bird is preferred to that of the older slow-grown bird.

In order to indicate the costs of production under the various systems of feeding adopted, Table III. has been prepared indicating the milk content of the ration, age, weight of bird, and cost in pence—

TABLE III.

Section.	Milk Content of Ration.	Weight of Bird.	Age.	Cost in Pence.
	Per cent.	Oz.	Weeks.	d.
6	50	56	14	13·8
4	40	55	16	14·3
2	20	55	21	15·2
5	5	53	21	12·5
3	20	53	21	14·6
1	20	52	21	15·6

From the foregoing table it will be noted that the cost of rearing cockerels in Section 6 to fourteen weeks of age was slightly greater than was the case in Section 5, where the birds were kept to the age of twenty-one weeks.

In determining the most economic rearing ration the breeder must take into consideration the cost of food, the time occupied to obtain results, and the condition of the flesh of the bird. When this is done the choice in this instance would be given to Section 6.

It must, however, be pointed out that where good results are obtained by feeding a relatively costly ration, the advantages gained can easily be lost by holding the birds for a week or so beyond the most economical period for marketing.

In these experiments the cost of rearing has only been given for the food used from the time the cockerel chickens were six weeks of age.

Cockerels are generally reared to the age of about six weeks with the pullets, then culled and sold. The market value at this age would be in the vicinity of three pence per chicken; therefore this amount should be charged to the costs.

The cockerels reared in the tests realised 1s. 9d. each. In the pen-feeding tests the best results were obtained for an expenditure on food of 12·6d. To this must be added the market value of the chicken at six weeks—viz., 3d. Therefore the profit over cost of feed was 5·4d. per bird.

In the battery tests, the most economical development was obtained for an expenditure in feed of 13·8d. Adding the value of the chicken brings the costs to 16·8d; consequently, the profit over costs in this instance was only 4·2d. per bird.

It naturally must rest with the farmer to decide whether the raising of cockerels of the Leghorn variety for market is justified. The prices realised for the birds from these tests are not encouraging, but it must be pointed out that the average value was depreciated by retaining some of the groups until the birds became a trifle staggy.

SUMMARY.

The results from these tests indicate—

That the battery system of rearing is efficient.

That the best results were obtained by the feeding of a ration carrying a slightly higher protein content than that usually used for growing pullets.

That as milk induces consumption and is a desirable protein-rich food, it should be used in all rations in some form when easily obtainable.

That variety in the ration appears to give the most economic results, and appears a necessity to increase economically the protein level.

Land for Grazing Selection.

SESBANIA RESUMPTION.

SESBANIA Resumption is situated from 20 to 30 miles northerly and westerly from Corfield, on the Hughenden-Winton Railway, and embraces three portions, with areas ranging from 30,000 acres to 46,500 acres. The blocks will be open at the Land Office, Hughenden, on Thursday, 7th June, for a term of lease of twenty-eight years, at annual rentals of two pence and one penny farthing per acre for the first seven years of the term.

Portions consist of high open downs, with well-shaded channel country along the creeks, and are well grassed with Mitchell, Flinders, barley, blue, and other grasses. The land is good fattening and wool-growing country, and two of the blocks are sufficiently shaded to make good lambing country.

Water supplies are obtained from three bores, two of which are flowing, and one block is already sufficiently watered.

Other improvements comprise a cottage, hut, yards, and fencing.

Each selection will require to be stocked to its reasonable carrying capacity with the applicant's own sheep within a period of three years, and proof must be furnished of the financial standing and pastoral or land experience of the applicants.

Free lithographs and full particulars may be obtained from the Land Agent, Hughenden, the Land Settlement Inquiry Office, Brisbane, and the Government Intelligence and Tourist Bureaux, Sydney and Melbourne.

Queensland Weeds.

By C. T. WHITE, Government Botanist.

MIST FLOWER (Eupatorium riparium).

Description.—A spreading herbaceous weed with numerous stems to a single plant, the stems decumbent at the base and rooting at the lower nodes. Leaves opposite, lanceolate in outline, varying somewhat

PLATE 131.
Mist Flower (*Eupatorium riparium*).

in size, but the adult ones mostly about 3 inches long and 1 inch wide, tapering at the base into a slender leaf stalk or petiole of about 1 inch; margins deeply and coarsely saw-toothed. Flowers white, the individual flowers very small and borne in small dense heads, the heads arranged in terminal sprays or corymbs 3 inches or more across. Seeds (achenes) slender, one line long, angular and hairy on the angles, surmounted by about twenty fine white hairs (pappus); the hairs themselves very finely barbellate or plumose.

Distribution.—A native of Mexico introduced into Queensland as a garden flower, now established as a weed along streams and in wet places generally in South-eastern Queensland.

Botanical Name.—*Eupatorium* commemorates Eupator, King of Pontus, who is said to have used a plant of this genus in medicine; *riparium* (Latin), referring to its preference in growing along creek banks.

Properties.—It is not known to possess any harmful or poisonous properties. It is frequently grown in bush-houses and in shady flower beds as an ornamental plant. In Europe and North America it is cultivated to a limited extent as a florists' flower.

Eradication.—So far as I have personally observed, the plant is confined to creek banks and wet situations generally. The plant has been gazetted a noxious weed, however, at the request of the Nerang Shire Council, who report it to be a serious pest on farms in the wetter country towards the ranges in their shire.

When the weed is too abundant to be dealt with by hand-pulling or hoe-chipping, it should readily succumb to an application of weak arsenical spray. Where the use of arsenic is undesirable on account of grazing stock, "Weedex" or other sprays containing calcium chlorate could be used. For plants such as Mist Flower a 2½ per cent. solution should be sufficient. The Agricultural Chemist (Mr. E. H. Gurney) advises that though reports have been received stating both sodium and calcium chlorates are safe so far as stock are concerned (stock having been grazed without ill-effects in paddocks where vegetation has been sprayed with these substances), care should be taken that stock are not allowed to get at tins containing the concentrate or unused spray.

Botanical Reference.—*Eupatorium riparium* Regal in "Gartenflora," vol. xv., p. 324, tab. 525.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

Agricultural Notes.

By H. S. HUNTER, Agricultural Branch.

Seasonal Prospects.

THE month of April opened with rains which were welcome owing to the dry conditions of March. Unfortunately, the Darling Downs, where a good downpour was most needed, received but little benefit, and the falls which were recorded in that area were of a very scattered nature. Further rains west of the range would permit of the sowing of early wheat and other winter-growing cereals, and provide a start for crops sown in some instances on a dry seed-bed. In many cases, on the heavy soils, the breaking-up of the land is being delayed owing to its hard condition, due to the compacting action of the heavy January-February rains followed by the dry conditions of March.

In the coastal districts the rains persisted throughout the first two weeks of the month and, between waterlogging and the absence of sunlight, a good deal of injury was occasioned to ripening root, grain, and fruit crops. Flooding again occurred in the far-northern areas, and minor floods were experienced in local areas in the South.

Sugar.

With continued rains and fair atmospheric temperatures, the progress of the cane crop was reasonably satisfactory in all areas. The backward cane in the far North has shown but little recovery, however, and excessive rains during the month of April have further spoiled its chances of making good. Grub damage is making itself evident from Innisfail to Cairns, and large areas have been completely destroyed by the pest.

The Burdekin and Mackay areas promise heavy crops for the coming harvest; in the former area, particularly, the yield per acre may exceed the high figure attained in 1933.

The well-drained soils of the southern districts have benefited from the continued heavy rains, and crop growth on these areas has been fully maintained until the recent cold spell. Where drainage is not satisfactory the crop has suffered, and water-logging is serious.

On the whole, the Queensland crop would appear to be well up to the average of recent years. More precise data in this respect will be gathered during May.

Maize.

The harvesting of the mid-season maize crop now is in full swing, and some excellent yields are being obtained. The late-sown crop also holds good promise, except in the Darling Downs areas, where the yield will be affected by lack of rain. All maize-growing districts in Southern Queensland yielded a good crop of early maize, and the total yield for the season should be well above the average. Unfortunately, market prices are at a low level, and, as a consequence, many growers are storing their grain for use on the farm or until prices improve.

Wheat.

Practically all of the season's wheat now has been delivered to the Pool. The quantity received up to the first week of April amounted to 3,936,806 bushels. The total yield should be in the vicinity of 4,350,000 bushels.

Cotton.

The harvesting of the cotton crop continues at a good rate. Very heavy receivals are arriving daily, particularly at the Glenmore ginnery, where over 3,000 bales have already been ginned. Owing to the better yields in the Central district it has been found necessary to reopen the Gladstone ginnery, where good consignments are steadily arriving. Whilst the rate of receivals has not been so heavy at the Whinstanes ginnery, it is anticipated that more than a normal crop will be treated there, as reports from the various districts indicate nice yields except in the more southern sections, where climatic and insect troubles have lowered the season's crop, particularly in the Central district, is better than that of last year.

Dairying.

The output of dairy products is now suffering a seasonal decline, but the season's production will eclipse all previous records. Queensland this season has displaced Victoria as the chief butter-exporting State of the Commonwealth. Victoria's exports, which, up to 18th March last, amounted to 27,487 tons, are 11,149 tons less than for the corresponding period of last year. The falling-off can be attributed, no doubt, to the heat wave conditions which occurred on two occasions in the southern part of the continent. Queensland, with the assistance of an unusually favourable season, has increased its exports in the same period by 4,515 tons to a total of 28,855 tons.

The attention of statesmen and dairymen has again been directed to the question of restricting exports of butter. The principle of the restriction of production of primary products is a world-wide and, in Australia, a momentous question of concern, not only to the producer but to the whole community. Practically every product exported from Australia is either subject to or threatened with some measure of restriction from forces operating beyond the borders of our country.

Potatoes and Arrowroot.

Both of these crops suffered to some extent in the coastal districts, particularly in badly drained localities, from the continuous wet weather early in the month. Shortage of supplies from the Southern States has resulted in an appreciable rise in potato values on the local market, and as the crops of Victoria and South Australia suffered from the heat wave, the Queensland crop should meet with good prices when it comes on the market.

The arrowroot crops on the South Coast were adversely affected by rain on the lower areas. On the higher ground good yields should be harvested, but decreased areas and unfavourable conditions may result in the total yield being about 200 tons less than that of last year.

Tobacco.

The curing of tobacco leaf is being carried out in most districts, but the total yield will be considerably less than in 1933. With the current season, many areas of land which have proved their unsuitability have been abandoned or devoted to other crops. The season was far from suitable for the raising of seedlings, mainly owing to the prevalence of blue mould. In numerous instances growers who had failed to raise seedlings in their first attempt later succeeded by adopting the use of sprays recommended by the Department, but many of these beds were sown very late in the season, and it is feared that the growers concerned have little chance of harvesting a satisfactory crop.

French Beans.

SUPPLIED BY THE FRUIT BRANCH.

A CONSIDERABLE variety of beans is grown in Queensland, but it is generally recognised that, for all-round commercial purposes, the Canadian Wonder holds first place. Another variety, Feltham's Prolific, reputably hardy and a good cropper in New South Wales, is grown fairly extensively in some districts, but an unbiassed comparison of the two varieties from all aspects leaves the balance in favour of Canadian Wonder.

Planting usually takes place from September to April, though sowings may be made earlier according to the district's susceptibility to frosts.

In many parts of the State great difficulty is experienced in raising a crop during the hot months due to the ravages of a small fly for which up to the present there is no satisfactory control. During the colder months this pest disappears, and in the coastal districts free from frosts planting may be done at this period. The hilling of the plants, after they are about 6 to 7 inches high, at times assists in partially overcoming the damage caused by the fly. Rotation of crops and destruction of all plants after the crop is harvested are helpful in disease and pest control.

In preparing the land for market garden crops, along with cultivation, they generally require the free use of well-rotted stable or other manure, but in the case of beans the application of a heavy coat of such manures often results in the plants producing an abundance of foliage with resultant loss of bean pods. Beans, therefore, are suited by a well-cultivated soil, and preferably one that has been manured for a preceding crop. Failing this a light dressing of artificial manures rich in phosphates or potash will have a beneficial effect.

The Agricultural Chemist, in his pamphlet on Complete Fertilizers, advises:—Beans grow well on almost any soil, but prefer a well-drained clayey loam. Like all leguminous crops beans require lime, and the soil should contain a fair amount of this plantfood. Apply per acre, according the quality of the soil:—

> None to ½ cwt. of nitrate of soda; 2 to 3 cwt. Nauru phosphate—superphosphate mixture; ¾ to 1½ cwt. of sulphate of potash.

When the beans are grown to be eaten green, the amount of nitrogenous manure can be considerably increased, using 1 cwt. of nitrate of soda applied in three or four portions as top dressing, which greatly improves the succulence and flavour of the pods. Use from 3 to 6 cwt. of a 0-14-8 or 2-12-6 mixed fertilizer per acre.

For use in gardens apply per square yard: ¼ oz. nitrate of soda; 2 oz. superphosphate; 1 oz. sulphate of potash; or 3 to 4 oz. of the 2-12-6 mixture, followed by two or three top dressings of ¼ oz. nitrate of soda.

Planting is usually done by striking out shallow drills and dropping the seeds by hand and covering by light harrowing. The rows are usually 2 feet 6 inches to 3 feet apart, with 6 to 8 inches between the plants, and 35 lb. of small or 52 lb. of large seed is sufficient to plant an acre.

Horse cultivation is usually carried out, but it is not advisable that this work should be commenced in the early morning or at any time when the crop is wet, as the spores of certain diseases are more easily carried under these conditions.

Weeds should be kept in check, as they will seriously affect the growth of the crop.

The maximum output of beans can only be gained by picking thoroughly as they become fit, that is, when young and tender; otherwise they will begin to form seed, and the plants will cease to bear marketable beans.

Medicinal Value of the Pineapple.

A RECENTLY published report by Dr. J. R. Killian,* the distinguished American scientist, on the nutritional value of canned pineapple, indicates that this popular fruit may be extensively used by doctors and dentists in their fight against pyorrhœa. Dr. Killian's report, which is the result of two years' research at the University of Hawaii, has, amongst other things, established canned pineapple as one of the most consistently reliable anti-scorbutics available throughout the seasons. Dr. Hanke, of the University of Chicago, has found, during an intensive study of dental disease and diet, that many striking cures of pyorrhœa and dental decay have been effected by the consumption of large quantities of anti-scorbutics, which are rich in vitamin C. Canned pineapple, it has been established, has as high a vitamin C content as the anti-scorbutics used in Dr. Hanke's experiments, and has also a high content of vitamins A, B, D, and G.

In experiments undertaken in connection with the Indian disease, beri-beri, which is a nutritional disorder, canned pineapple was found to contain the vitamin B (B1) in sufficient quantities to prove very valuable in combating the disease. Canned pineapple, the report adds, was found to be a good source of iron, copper, and manganese, essential to a proper diet, in a readily assimilable form. Test meals were given to a large number of subjects, and it was found that the incorporation of pineapple in the meal stimulated the protease activity in the stomach and definitely speeded up digestive process.

While the vitamin content of fresh vegetables varied considerably with the season of the year, the report adds, the vitamin content of pineapple was not injured by canning, and maintained a consistent level throughout the season.—"The Agricultural Gazette" of New South Wales.

* "Australian Food Manufacture," 5th January, 1934.

PLATE 132.
The Barron Falls, North Queensland.

PLATE 133.

Lake Barrine, bordered by dense tropical jungle, Atherton Tableland, North Queensland.

PLATE 134.
The Barron River near Kuranda, North Queensland.

Plate 135.

Outlook from Wootha, near Maleny, South Queensland, the Glasshouse Mountains in the distance.

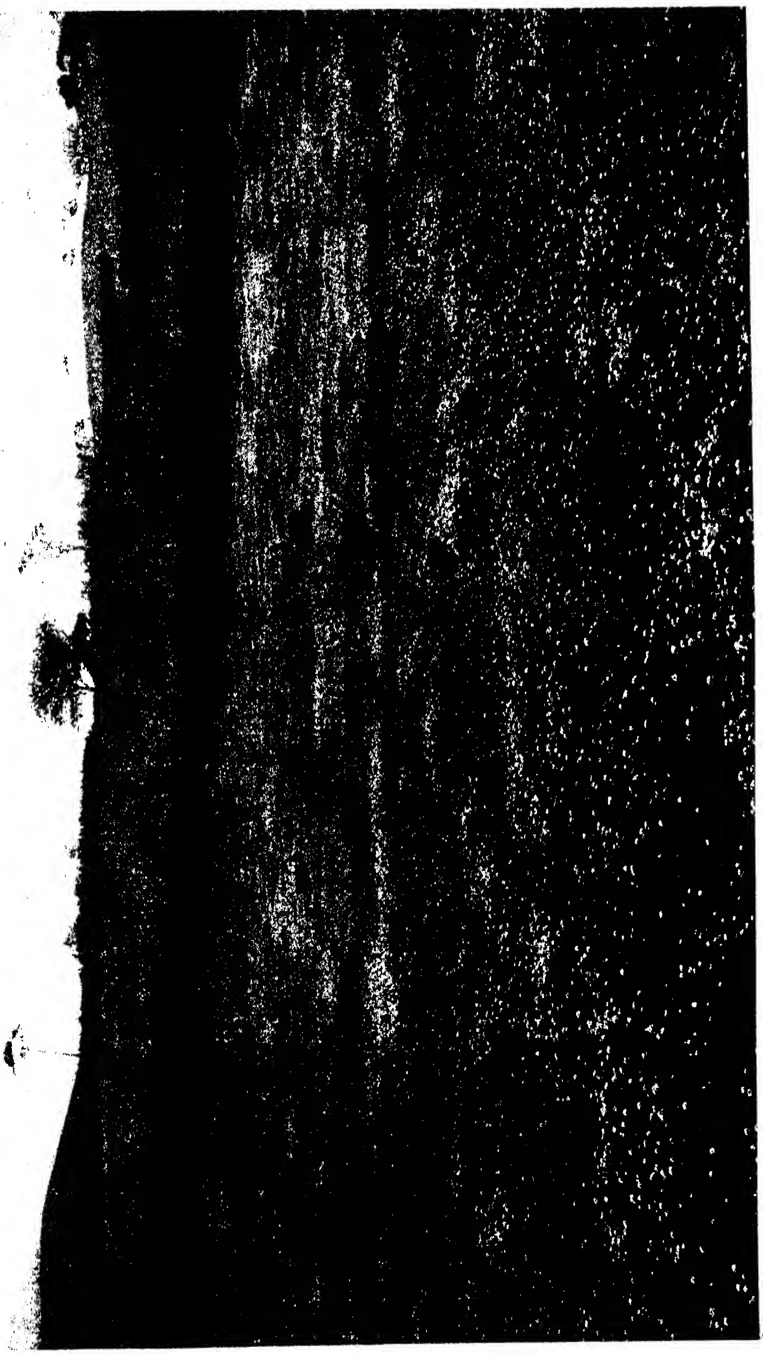

PLATE 136.
A field of clover, Mr. Cole's home farm, Maleny, South Queensland.

PLATE 137.
A banana plantation on Buderim Mountain, Queensland

LIST OF LICENSED BRISBANE FARM PRODUCE AGENTS.

Addis Bros.
Allen, J.
Anderson, Edward Arthur
Archer and Goss
Arkell, W., and Sons
Australian Fruit and Produce Co.
Barnes and Co., Pty. Ltd.
Barr, Alexander S.
Barron, Orr, and Co., Pty. Ltd.
Barter, G. and W.
Bowden, T. S., and Co.
Brabant and Co.
Burns, Philp, and Co., Ltd.
Burrell, Fenton, and Co., Pty. Ltd.
Carseldine, Arthur W.
Carter, Alfred J.
Chave, Alfred E.
Clark and Jesser
Collard and Mackay
Comino Bros. Pty. Ltd.
Committee of Direction of Fruit Marketing
Cooksley, Jack Royston
Cooksley and Co.
Cooper Bros.
Cranley, J. P., Pty. Ltd.
Cripps, William
Dairy Products Co-op. Co. Ltd.
Dalgety and Co. Ltd.
Davies, W. C., and Co.
Dean, Henry, and Sons, Pty. Ltd.
Edward, George
Eriksen, Hans P.
Evans, Arthur L.
Evans, Norman
Farmers' Co-op. Distributing Association of Queensland, Ltd.
Foggitt, Jones, Pty. Ltd.
Foley Bros., Ltd.
Fong Pie and Co.
Francis, Frederick W.
Gall, George
Geeves, Hedley, Ltd.
Gesler, Frederick C.
Good, D. E.
Granite Belt and Coastal Fruit Agency
Guinsberg, Israel
Hall and Pascoe
Harris, H. N., and Co.
Hodges and Pratt
Hutton, J. C., Pty. Ltd.
Izatt and Johnson
Jacklyn and Jacklyn
Jackson, J., and Co. (Produce and Seeds), Pty. Ltd.
Johnson and Markwell, W.
Johnston, Adam
Johnston, Reginald W.
Johnston, William
Jordan, Ernest Arthur
Justins and Finlayson
Laidlaw and Co., G.
Lambert, G. and W.
Leavy, James H.
Livingstone, J. R.
Luxford, S.
Mackay, William M.
Mant, Charles O.
Martin, Duncan G.
Martin and Co.
Matthews, John
Mendoza and Wright, Pty. Ltd.
Murray Bros.
Murray, John
McCausland, Louis J.
McCook Bros.
McCowan and Hammond
McDowall, Edward
New Zealand Loan and Mercantile Agency Co., Ltd.
Nicholson, Alphonso
Pettigrew and Wilson
Plint, H. C.
Potter, W. E.
Queensland Fruit Distributors
Robinson and Laidlaw
Robsons, Ltd.
Russell, H. M., and Co., Pty. Ltd.
Scott, Garrad, and Co.
Sellars, Derek P.
Sellars, R. B.
Shay, Percy Robert
Sibley, P. C.
Siemon, W., and Sons, Pty. Ltd.
Skinner, P. J.
Spence, J. W.
Stanton Bros.
Stanton, Harry
State Produce Agency Pty. Ltd.
Stewart and Walker
Sutton Bros.
Tacey and Eyre
Thorpe, H. W.
Wanless, Thomas H.
Watson, W. P., and Co.
Whatling, E. H. R.
Wiltshire, F. C. G.
Winters, E.
Wool, A. E.
Wool, H. L.
Yow Sang and Co.

LIST OF LICENSED COUNTRY FARM PRODUCE AGENTS.

Backhouse, J. J. C., Killarney
Baker, G. H., Stanthorpe
Barben, F. J., Gladstone
Berlin, E. A., Marburg
Black, H. L., Mackay
Bramble, J. G., Rockhampton
Brand, Thomas, Mackay
Curtis, W. E., and Co., Bundaberg
Dawson Joseph, Rockhampton
Dimind, A. B., Mackay
Ellwood, E. A. Killarney
Elwing, J. A., Rockhampton

List of Licensed Country Farm Produce Agents—*continued.*

Featherstonhaugh, Albany, Roma
Foley, P. J., Mackay
Goltz, F. W., Mackay
Good, D. E., Rockhampton
Gore, Edward, and Co., Oakey
Gower, H. R., Rockhampton
Griffiths, G. H., Rockhampton
Haigh, E. V., Ipswich
Harding and Walker, Ipswich
Heers, J. W., Coominya
Jones, J. E. L., Gladstone
Joyner, R. G., Gladstone
Lee Sang and Co., Cairns
Leonard, T. J., Mackay
Leong Sun, Townsville
Limpus, Bert, Bundaberg
Limpus, C. M., and Co., Bundaberg
Lindemann, C. H. D., Lowood
Lymburner, E. A., Cairns
Mackay District Co-op. Fruit, Vegetable, Poultry, Bacon Association, Ltd., Mackay
Manz, Walter, Lowood
Mar Kong, Townsville
Maxwell, Samuel, Warwick
Melrose and Fenwick Pty. Ltd. (trading as Townsville Fruit Exchange), Townsville
Moynehan, W. J., Imbil
Olsen, A. E., Killarney
Poll and Co., Wynnum Central
Profke, Albert, Lowood
Ransome, V. W., Warwick
Reason, S. C., Warwick
Redmonds Pty. Ltd., Bundaberg
Reeds Pty. Ltd., Maryborough
Rex, J. W., Maryborough
Reye, C. A. H., Townsville
Richardson, A. N., Rockhampton
Robinson, John, Toowoomba
Stay, W. H., Toowoomba
Tatnell, W. R., Gympie
Thomas, D. B., Gympie
Thomas, George, Gympie
Thomas, L. J., Gympie
Thompson, Sydney, Warwick
Thorpe, T. E., Cairns and Townsville
Tong Sing and Co., Cairns
Tung Yep, Cairns
Turner, George Baden Powell, Bowen
Walker, E. E., Gympie
Walker, Shaw, Townsville
Walters, W. J., Lowood
Warrys Pty. Ltd., Maryborough
Waters, Punzell, and Williams, Mackay
Willie Young, Rockhampton
Wilson, John, Kingaroy
Wright, D. C., Charleville

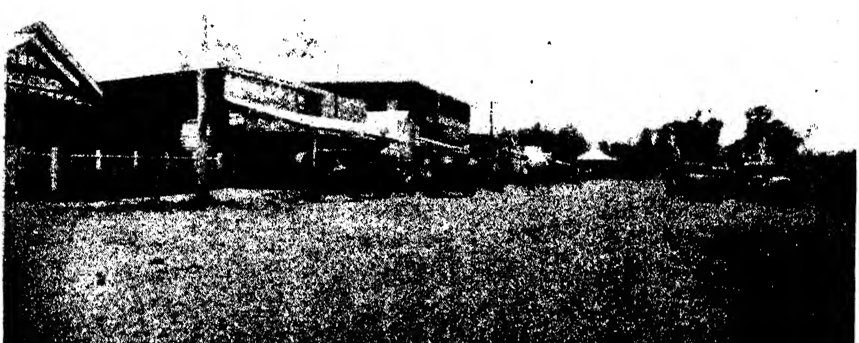

PLATE 138.
Main street, Biloela—the centre of a progressive cotton-growing district, Queensland.

QUEENSLAND SHOW DATES, 1934.

May.

Taroom, 1st and 2nd (Camp Draft, 5th)
Dalby, 3rd and 4th
Beaudesert, 2nd and 3rd
Nanango, 3rd and 4th
Blackall, 7th to 9th
Chinchilla, 8th and 9th
Charleville, 8th to 10th
Crow's Nest, 9th and 10th
Boonah, 9th and 10th
Monto, 9th and 10th
Kingaroy, 10th and 11th
Ipswich, 15th to 18th
Miles, 16th
Kilkivan, 16th and 17th
Mitchell, 16th and 17th
Mundubbera, 16th and 17th
Dirranbandi, 16th and 17th
Wondai, 17th and 18th
Roma, 22nd to 24th
Gympie, 23rd and 24th
Emerald, 23rd and 24th.
Biggenden, 24th and 25th
Murgon, 24th to 26th
Toogoolawah, 25th and 26th
Kalbar, 26th
Goomeri, 29th and 30th
Biloela: 31st May and 1st and 2nd June.
Wallumbilla: Cancelled.

June.

Maryborough, 1st, 2nd, and 4th
Marburg, 1st and 2nd
Childers, 5th and 6th
Gin Gin, 5th and 6th
Bundaberg, 7th to 9th
Lowood, 8th and 9th
Bororen and Miriam Vale, 11th and 12th
Gayndah: 13th and 14th
Wowan, 14th and 15th
Rockhampton, 19th to 23rd
Mackay, 26th to 28th
Laidley, 27th and 28th

June—*continued*.

Proserpine, 29th and 30th
Townsville Camp Draft, 30th
Mount Larcom: No Show.

July.

Bowen, 4th and 5th
Gatton, 4th and 5th
Kilcoy, 5th and 6th
Ayr, 6th and 7th
Townsville, 10th to 12th
Woodford, 12th and 13th (Sports only)
Rosewood, 13th and 14th
Cleveland, 13th and 14th
Cairns, 17th to 19th
Charters Towers, 18th and 19th
Caboolture, 20th
Nambour, 18th and 19th
Atherton, 24th and 25th
Barcaldine: 24th and 25th
Esk: 27th and 28th
Pine Rivers, 27th and 28th

August.

Royal National, 6th to 11th
Home Hill, 31st August and 1st September

September.

Enoggera, 1st
Imbil, 7th and 8th
Ingham, 7th and 8th
Pomona, 12th and 13th
Innisfail, 14th and 15th
Beenleigh, 20th and 21st
Mareeba, 20th and 21st
Rocklea, 22nd
Malanda, 26th and 27th
Kenilworth, 29th

October.

Southport: 5th
Millaa Millaa, 5th and 6th
Tully, 12th and 13th

IMPORTANCE OF MODERN DAIRY BUILDINGS.

Apart from the fact that the law imposes certain obligations on persons who erect dairy farm buildings, there are many other good reasons why these premises should be built according to well-designed plans. Among the reasons in favour of better dairy farm buildings are—They afford more protection from contamination for milk and its products. They help towards greater efficiency and economy. They are easier to maintain and to keep clean. They ensure better quality products by improving ventilation, cooling capacity and light.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production charts for which were compiled during the month of March, 1934 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Linda 8th of Kilbirnie	Macfarlane Brothers, Radford	14,335·3	562·576	Mowbray 2nd of Kilbirnie
Dot of Frenchview (257 days)	W. J. Freeman, Rosewood	11,243	436·783	Jubilee's Admiral
Foremost 2nd of Blacklands	A. Pickels, Wondai	11,505·3	422·425	Sir Hugh of Hillview
Charm II. of Bri Bri	A. E. Vohland, Aubigny	11,533·9	422·366	Gay Boy of Tyrone
Pearl 11th of Quarnlea	Lehfeldt Bros., Kalapa	10,273·49	384·912	Lord Nelson of Blacklands
Ethel 11th of Raleigh	A. Pickels, Wondai	11,052·2	362·944	Democrat of Raleigh
Biddy 5th of Railway View	H. Embrey, Rosewood	9,546	355·531	Elected of Railway View
SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB.				
Venie of Wilga Vale	C. O'Sullivan, Greenmount	12,685·46	511·939	Reliance of Blacklands
JUNIOR, 4 YEARS (UNDER 4½ YEARS), STANDARD 310 LB.				
Madam 3rd of Cedar Grove	H. Embrey, Rosewood	8,777	370·692	Duke of Cedar Grove
Dell of Cedar Grove	H. Embrey, Rosewood	7,692·5	325·522	Mabel 2nd's Victor of Coral Grange
Blacklands Strawberry 6th (266 days)	A. M. Johnson, Gracemere	8,429·68	320·293	Governor of Blacklands
SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.				
First 21st of Quarnlea	Lehfeldt Bros., Kalapa	11,507·78	431·621	Nugget's Lad of Hillview
Flirt of Glengallan	R. Tweed, Kandanga	9,806·1	381·017	Nobleman of Blacklands
Cedargrove Shamrock 17th (268 days)	W. J. Freeman, Rosewood	7,593	328·303	Duke of Cedar Grove

	JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.			
Woodlyn Lily	J. Lyndon, Worongary	11,309·89	458·029	Spanker of Glenrock
Thelma 5th of Blacklands	A. Pickels, Wondai	7,636·6	317·774	Fussy's Monarch of Hillview
Ettie 7th of Blacklands	A. Pickels, Wondai	7,464·7	308·904	Governor of Blacklands
	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.			
Trevlac Mayflower (266 days)	W. J. Freeman, Rosewood	7,657·5	311·098	Butterboy of Railway View
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.			
Navillus Myrtle	C. O'Sullivan, Greenmount	7,901·26	336·479	Midget's Sheik of Westbrook
Cedar Grove Ivy 13th	C. O'Sullivan, Greenmount	6,774·76	282·891	Duke of Cedar Grove
Miss Myrtle 2nd of Blacklands	A. Pickels, Wondai	7,757·8	259·75	Limelight of Parkview
	JERSEY.			
	SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB.			
Flo of Rosehill	F. R. Nimmo, Rosewood	9,703·5	541·001	Raleigh's Lad of Rosehill
	SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.			
Glenmah Victor's Irene	F. A. Maher, Indooroopilly	6,597·47	333·655	Retford Victor's Noble
Glenmah Victor's Matilda	F. A. Maher, Indooroopilly	6,365·57	318·223	Retford Victor's Noble
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.			
Bellegarth Princess Chime	D. R. Hutton, Cunningham	6,129	308·629	Bellefaire Blonde's Bellringer
Bellegarth Rosalie	D. R. Hutton, Cunningham	4,618·75	263·223	Bellefaire Blonde's Bellringer

Answers to Correspondents.

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. Cyril T. White, F.L.S.

Bassia Burr.

INQUIRER (Brisbane)—

The only satisfactory means we can think of for the eradication of the Bassia Burr is the ordinary one of cutting off, stacking together, and burning. If the area is a large one, possibly there is some gear on the station that can be used for the purpose. If the plants are cut off at the present time or broken down and raked together, I do not think there is any chance of the old roots shooting again. Of course care should be taken not to distribute the seeds of the plant any more than possible in the process of raking-up.

Western Grasses and Plants.

G.C.B. (Longreach)—

Astrebla pectinata, sometimes called the Upright Mitchell.

Astrebla lappacea, usually called Curly Mitchell.

Astrebla squarrosa, Bull Mitchell. As mentioned there is another variety of Mitchell, namely *Astrebla elymoides*. This is the variety which is generally called Weeping or Hoop Mitchell.

Iseilema membranacea, Flinders Grass, tall variety.

Iseilema actinostachys, Flinders Grass, dwarf variety.

Eulalia fulva, Brown Top. This grass has been very highly spoken of as a fodder in New South Wales and by some authorities in Queensland, but so far as we have observed stock do not take readily to it. Have you noticed stock eating it at all in your district?

Dactyloctenium radulans, Button Grass.

Atriplex Muelleri. This apparently is the commonest Salt Bush in most parts of Western and Central Queensland. So far as we have observed it is not eaten by stock to any great extent. Stock very often prefer these salt bushes when they are dying off rather than when they are green and luxuriant.

Acacia farnesiana, Mimosa.

Feather Top.

F.W. (Lanefield)—

The specimen is *Chloris virgata*, a grass very closely allied to the common Rhodes Grass (*Chloris Gayana*). It does not, however, seem to possess the palatability of Rhodes Grass, and where Rhodes can be grown has no advantage over it. Though a very luscious-looking grass, our experience has been that stock reject it when other feed is available. We have heard, however, that it makes excellent hay, and that in this form stock eat it readily enough. The only local name we have heard applied to the grass is Feather Top.

Guinea Grass.

H.D. (North Arm, N.C.L.)—

The grass is *Panicum maximum*, Guinea Grass. This grass was cultivated rather extensively some years ago as a fodder, but went out of favour, perhaps on the introduction of Paspalum. There is no doubt that Guinea Grass is relished by stock, and we think a small paddock, say 2 to 5 acres, of grass such as this and Blue Panic should make a great standby for dairymen. The grass is frost-tender, but this may not trouble you at North Arm. It is propagated from seed or roots, but the seed, though produced in abundance, give a low percentage of germination. To obtain the best results the grass must be either fed or cut down.

Grasses and Plants Identified.

G.L.T. (Goodwood)—

Eragrostis diandra, a Love Grass. The name Love Grass is applied in a general way to species of the genus *Eragrostis* on account of their beauty.

Erigeron linifolius, Peg Weed, also called Rag Weed, though this latter name belongs more correctly to another plant.

Acacia Cunninghamii (?), as far as can be told from the specimen. The spikes were rather young to be certain. This wattle is often called Black Wattle in Queensland.

Rhynchospora sp., a species of Sedge. Under separate cover I am posting you a book by the late F. M. Bailey which gives the distinctions between grasses and sedges.

Eragrostis australiensis (?), as far as can be told from the rather small specimen. This particular Love Grass is known as the Beach Love Grass because it commonly grows over the sand dunes.

Alloteropsis semialata, Cockatoo Grass.

Eragrostis leptostachya, Paddock Love Grass.

Aristida sp., a three-pronged Spear Grass. We cannot give you the species as the seeds were badly smutted, but the genus is a large one and the seeds are rather troublesome to stock, especially sheep, sometimes working right under the skin and sometimes even into more vital parts of the animal.

Eragrostis elongata, a Love Grass.

Eucalyptus trachyphloea, the White Bloodwood. This determination is as far as can be told from the specimen. With Eucalypts or Gum trees it is always advisable to add a note on the bark, whether rough and flaky, stringy, smooth, &c.

Themeda australis, Kangaroo Grass.

Echinochloa colona, sometimes called Wild Millet, a grass very widely spread over the warm regions of the world and very closely allied to such well-known fodders as White Panicum and Japanese Millet.

Acacia flavescens, a wattle for which we have heard no very distinctive local name. We would be very glad to have local names for any of the specimens you care to send, because common names must come from people in the bush and not from the botanist.

There is no very comprehensive work on Australian trees, flowers, and grasses of a popular nature. Most of the comprehensive ones are technical, but there are a few cheap little nature study books you could get. For the wildflower study of your locality the best little book I think would be "Flowers of Our Bush," by Mrs. L. Thomson, price 2s. 6d. For grasses the best book would be "Grasses and Fodder Plants of New South Wales," by E. Breakwell, price 6s. Although this deals with New South Wales, most of the grasses mentioned occur in Queensland. A work recently issued, containing illustrations and descriptions of over 200 different sorts of orchids, ground and epiphyte, is "Gems of the Bush," Sun Nature Study Book No. 5, price 6d. For general botany you would find "The Story of Our Plants," by Miss C. le Plastrier, price 2s., a useful little work. A book on weeds is "Weeds and Poisonous Plants of Queensland," by F. M. Bailey, price 4s., obtainable from this office.

Caustic Creeper.

J.S. (Whetstone, S.W. Line)—

The specimen is the Caustic Creeper, *Euphorbia Drummondii*, a plant very common in Queensland and very widely distributed through New South Wales and the Northern Territory. It is generally regarded as poisonous to stock, though reports about it are conflicting. So far as we have seen, ordinary paddock stock seem to browse among the plant and eat it with impunity. Travelling stock, however, particularly sheep, are often badly affected by it. In New South Wales it has been found that the plant possesses a prussic-acid yielding glucoside, but repeated tests with Queensland material have always given negative results, and the symptoms described by Queensland sheepmen are certainly not those of prussic-acid poisoning. The symptoms are that the head and neck swell to an enormous size, and if the swelling be pierced an amber-coloured fluid runs out. The skin shrivels and the face of the sheep looks as if it had been badly burned, but its life is generally saved. There is no cure definitely known for the after effects of eating the plant.

Daisy Burr.

H.H.W. (Gladstone)—

The specimen is Daisy Burr, *Calotis scapigera*, a plant with a fairly wide distribution in Queensland, but most abundant on the Darling Downs. It has probably been introduced into your district with travelling stock, most probably sheep. The plant has possibilities of becoming a bad weed, and as the patch is only small it would be best destroyed by hand-cutting, raking together, and burning; or if you prefer you can give it a covering of strong salt, such as waste butcher's salt. This should be applied in dry weather, and the first heavy rains would probably wash it out of the ground.

Balsam Pear.

H.A.J. (Maryborough)—

The specimen is *Momordica cherantia*, a plant of the Cucumber family, sometimes known as the Balsam Pear. It is a native of tropical Asia and Africa, and is much cultivated in warm countries as an ornamental vine. One sometimes sees this plant about Chinese gardens, and many Chinese eat the red pulpy stuff surrounding the seeds and eat the fruit boiled, generally before it is ripe. The Indians also use it a good deal in their curries. We have had no experience of the fruit ourselves as we are rather chary of these Cucurbitaceous plants, but we think, in this case, the fruit has to be soaked in water for some time before cooking to rid it of a somewhat bitter flavour. If you want to try it our advice is to cook and taste it discreetly.

White Millet.

R.S.McK. (Mungallala)—

The specimen is *Echinochloa colona*, a native grass with a very wide distribution over the warmer regions of the world. It is sometimes called White Millet, and is very closely allied to such well-known cultivated fodders as Japanese Millet and White Panicum. It is an excellent fodder grass and worth encouraging. The type of country you describe it as growing in is rather unusual for, as a rule, the grass prefers rather a damp situation, though it is not confined to such. It may often be seen as a weed in cultivation round cultivation headlands, &c.—in fact, anywhere where the ground has been disturbed.

Rattlepods.

J.M.N. (Caboolture)—

The specimen is obviously a legume, but bore neither flowers nor pods. It is a stranger to us, but we think it is *Crotalaria acicularis*, a species of Rattlepod, a very common weed in Java and the Philippine Islands. You have probably introduced it accidentally with some of your recent collections. Rattlepods are rather dangerous plants, as several of them, both in Australia and abroad, have been definitely proved by feeding tests to be poisonous to stock. So far as we have observed, however, stock generally avoid them. We would like a specimen with flowers and pods to verify the determination.

Green Cestrum, a Poisonous Plant.

R.C.B. (Chinchilla)—

Cestrum parqui, the Green Cestrum. A very poisonous plant which has been responsible for a good deal of trouble in parts of Queensland. It is not a native, but has either become accidentally introduced or is a stray from garden culture. It is a native of Chili and the Argentine, South America.

Creeping Salt Bush.

A.G. (Springsure)—

The specimen is *Atriplex semibaccata*, the Creeping Salt Bush, also frequently known as Salt Weed. It is one of the most valuable and palatable of the Salt Bushes and worthy of every encouragement. It grows naturally in parts of New South Wales and Queensland, in this State being most abundant, we think, in the Western Downs and Maranoa districts, but we have not had specimens from the neighbourhood of Rolleston before.

Weed in Oat Field—Scented Top.

G. (Hivesville, via Murgon)—

The heavy seed grass, a weed in Oats, is *Lolium temulentum*, a Darnel. This is an annual species of *Lolium* occurring mostly as a farm weed, and has very little value as a fodder. It is eaten in its young stages, but soon becomes unpalatable. The seeds are poisonous, but so far we have never come across any cases of stock-poisoning by them in Queensland, though it is a moderately common weed, particularly on the Darling Downs.

The grass with the light seed head is *Capillipedium parviflorum*, sometimes called Scented Top, owing to the peculiar scent of the seed heads when crushed. This grass is quite common in much of the forest country in coastal and sub-coastal Queensland, and is quite a good fodder. It is closely allied to the Blue Grasses.

Grasses Identified.

J.C. (Kilston, N.Q.).

Arundinella setosa, a grass fairly common in the forest country of Queensland, but of only secondary value as a fodder. We have not heard a local name applied to it.

Eragrostis elongata, Love Grass, is a name applied to several species of the genus *Eragrostis*. They are quite good grasses in the average native mixed pasture.

Heteropogon contortus, Spear Grass. Although the spears of this grass are very troublesome, particularly to sheep, nevertheless, especially in the young stages, it seems to be readily eaten by stock, and when mixed with more palatable food we have known it to make quite good chop-chop or chaff for horses and other stock.

Eriachne sp. There are several species of the genus Eriachne in Queensland. We have not heard a local name applied to the particular one you send.

Chloris ruderalis, a species of Star Grass, closely allied to the common Rhodes Grass (*Chloris Gayana*).

Polycarpaea spirostyles. This plant is commonly known as Copper Plant, for it is supposed to be an indication of copper. It is not a grass, but belongs to the family *Caryophyllaceæ*, which contains the Carnation, Dianthus, and some other common garden flowers.

In sending specimens for determination the usual practice is to number each specimen and retain a duplicate similarly numbered, when names corresponding to numbers will be forwarded.

Tape Vine.

W.D.C. (Wamuran)—

The specimen of vine is *Stephania hernandiæfolia*, known by the rather misleading name of Tape Vine. This vine has been repeatedly received at the Department of Agriculture and Stock as one suspected of being poisonous, and a number of years ago the late Dr. T. L. Bancroft found the roots to contain an exceedingly poisonous alkaloid which has since been found to extend to all parts of the plant. The plant is a very common climber on the edge of scrubs, and as it often creeps among grass, especially between rocks and stones, it is frequently eaten by stock, particularly cattle, with fatal results.

Lemon Grass.

J.M.F. (Dimbulah)—

The specimen is *Elionurus citreus*, commonly known as Lemon Grass. It is fairly abundant in parts of North Queensland and extends as far south as Moreton Bay, though it is comparatively rare in the more Southern parts of the State. It is unpalatable to stock, no doubt on account of its very markedly citron or lemon odour. The grass could probably be made more attractive to horses by mixing it with some other fodder that would mask the peculiar lemon flavour, though even then we are rather inclined to think that the horses would nose the Lemon Grass out of the way as far as possible. If you have a big stock of this grass and do not want to waste it, you would be well advised to try your mixture on a small scale instead of spoiling a lot of otherwise good fodder by mixing it with the Lemon Grass.

Japanese Clover.

G.W.C. (Kybong, via Gympie)—

The specimen of Japanese Clover (*Lespedeza striata*) has come safely to hand. We have had a great number of specimens of this plant from the North Coast, but more especially from the neighbourhood of Kilcoy and Woodford. Some residents claim that it has been there for years, but this is the first year we have noticed it; and it seems to be spreading to a very great extent. It is undoubtedly a valuable fodder plant and cattle seem fond of it, but it has the disadvantage of being a summer-growing legume and is inclined to smother out the grass. That has been the experience in some localities this season, but of course in more normal ones the plant may not be so vigorous.

Grasses—Crow Foot, Summer, Johnston.

L.B.S.R. (Mirriwinni, N.Q.)—

(1) Star Grass, *Eleusine indica*, Crow Foot Grass. This species is widely spread over the warmer regions of the world, and is mostly found as a weed of cultivation and waste places. It is quite palatable to stock, but contains a prussic-acid-yielding glucoside. Stock should be pastured on it, therefore, with a certain amount of care.

(2) Summer Grass, *Digitaria marginata*, a grass widely spread over the warmer regions of the world. Like the Crow Foot, it mostly occurs as a weed of cultivation rather than as a grass of the general pasture. It is quite a palatable grass, but dies off on the approach of the winter months.

(3) Johnston Grass or Johnston River Grass, *Paspalum conjugatum*, a common tropical grass. In parts of the Atherton Tableland it is known as "Sour Grass" or "Yellow Grass," and is said to ruin the common paspalum pastures and to have very little value either as a stockraising or dairying grass. The grass is very common as a cover in coconut and rubber plantations in New Guinea, and in such places we have seen working mules do quite well on it when it was almost their sole fodder.

Ferns and Crotons.

Mrs. P. (Eight-mile Plains)—The two specimens are—

(1) *Adiantum Whitei*, Maidenhair. Described since the publication of the lithograms.

(2) *Doodia caudata*. In "Ferns of Queensland," this species is recorded as a variety of a larger species, namely *Doodia aspera*, but has now been recorded as quite a distinct plant.

The plants mentioned by you as Climbing Maidenhair, Rock Fern, Hare's Foot, Elk-horns, Stag-horns, &c., are all true ferns.

Crotons are very easily struck from cuttings, but the time you will be receiving them (July) will be about the worst time of the year to do this work. We have grown a number of crotons and have been successful in striking them as late as the beginning of the first week in April, but this all depends on the weather. They really strike best from November to early January, requiring plenty of heat for root development. They strike well in either light sandy soil or in soil in which there is a fair percentage of gravelly creek sand. We have also been successful by using a fair proportion of furnace or boiler clinkers in the soil. If you try to strike them about July, you will have some difficulty without heat, although if you have a well protected sunny place, particularly if you have a little glass, you should be successful.

Barley Grass or Native Millet.

F.B. (Brisbane)—

The specimen of grass is *Panicum decompositum*, commonly known in Western Queensland as Barley Grass or Native Millet, although both these names, like many other local ones in Western Queensland, are rather loosely applied to a number of grasses. This particular *Panicum* is generally regarded as an exceptionally good fodder, relished by stock, and nutritious. So far as we have observed, however, it seems to grow best in damp situations, or in a particularly good season.

Grasses Identified.

W.D. (Goondiwindi)—Your specimens have been determined as follows:—

(1) *Astrebla lappacea*, Curly Mitchell Grass. This is the commonest species of Mitchell Grass in Queensland, and I think the best.

(2) *Astrebla elymoides*, commonly known as Weeping or Hoop Mitchell.

(3) *Thellungia advena.* I was very glad to get the local name "Coolibar" for this, also notes on its fodder value. It is certainly anything but a tempting looking grass, though stockowners elsewhere have told me that it is quite good feed. This grass is very common in Queensland and New South Wales, but in the past was confused with another species, the Rat's Tail Grass (*Sporobolus elongatus*). It was first named in comparatively recent years from specimens found growing in a woollen mill dump in Switzerland, and its native country was not known.

(4) *Dichanthium sericeum.*

(5) *Iseilema actinostachys*, Flinders Grass.

(6) *Panicum prolutum.* In New South Wales this grass is generally known as Coolah Grass.

(7) *Chloris ventricosa*, a species of Star Grass.

(8) *Eriochloa* sp., sometimes called Early Spring Grass. These grasses are all relished by stock. The genus is under revision at the present time at the Royal Botanic Gardens, Kew, therefore we cannot give you the specific name for it.

(9) *Chloris acicularis.*

S.L. (Tingoora)—

(1) *Chloris divaricata*, a species of Star Grass.

(2) *Sorghum leiocladum*, a native Sorghum.

(3) *Stipa setacea*, a species of Spear Grass.

(4) *Dichanthium sericeum*, Blue Grass. Generally regarded as one of the best of the native grasses.

(5) *Chloris ventricosa*, a species of Star Grass.

(6) *Themeda australis*, Kangaroo Grass. A valuable native grass, though it tends to disappear under heavy stocking.

(7) A mixture of *Panicum queenslandicum* and *Poa caespitosa* var. *australis*.

(8) *Poa caespitosa* var. *australis*.

(9) *Amphilophis decipiens*, Bitter or Pitted Blue Grass, generally regarded as a very inferior grass. Unfortunately, owing to the eating out of the better species in many native pastures, it has become quite dominant.

(10) *Eriochloa* sp., sometimes called Early Spring Grass. Quite a good fodder.

(11) *Poa* sp. Could you send complete material of the grass, including roots?

(12) *Eragrostis cilianensis*, Stink Grass. A rather ornamental grass, but so far as I have observed left untouched by stock. I have heard on good authority on one occasion, however, that horses took very readily to it.

Pigweeds.

D. (Townsville)—

The specimens have been determined as follows:—The small red Pigweed, *Portulacca digyna;* the larger and more upright Pigweed, *Portulacca filifolia.*

The Pigweeds are very abundant plants scattered over the warmer regions of the world. The two particular ones forwarded from near Boulia are both natives of Western Queensland and the Northern Territory. They are not known to be poisonous or harmful in any way, and the family as a whole is regarded as quite a wholesome one. Many of the Pigweeds, both in Australia and abroad, are eaten either cooked or raw as a vegetable. Like other fleshy plants, of course, they will cause hoven or bloat in stock, particularly hungry stock that are pastured on them on an empty stomach. Deaths may ensue, but this is more mechanical than toxic.

Caustic Creeper.

H.M.T. (Lochnagar)—

The Caustic Creeper, *Euphorbia Drummondii,* is looked on as a very poisonous plant both in Queensland and New South Wales. Examination of the New South Wales samples has repeatedly given positive results for the presence of a prussic-acid yielding glucoside, but examination of Queensland plants has always given negative or, at least, doubtful results.

The symptoms of Euphorbia poisoning as given by experienced stockmen in Queensland are certainly not those of prussic-acid poisoning. Prussic-acid poisoning is extremely rapid and, generally speaking, there are no outward symptoms. The chief characteristic of affected animals as observed in Queensland is a swelling of the neck and head. If this swelling is pierced an amber-coloured fluid exudes and the life of the sheep may be saved, though the face and head have the appearance of having been badly scorched.

The Caustic Creeper has a very wide range in Australia, proceeding in through Central Australia to parts of Western Australia, and in the last-mentioned State, Dr. D. A. Herbert, when Government Botanist there, carried out feeding tests on rats and produced the characteristic swelling symptoms recorded by experienced stockmen in larger animals here. Regarding the periods of toxicity of the plant, little on this point is known; but if the prussic-acid yielding glucoside is present the plant would probably be at its worst in the first cold weather after late summer rains. Regarding its growth, it is most abundant in the summer months but lasts right through the winter, and I have frequently seen plants growing in August and September.

Queensland Wattle in France.

L.P.H. (Brisbane)—

The common Wattle cultivated in the South of France for the English and Continental cut-flower trade is mostly *Acacia Baileyana.* This particular species, though it commemorates F. M. Bailey, is not grown to any extent in Queensland, except in the colder parts of the State about Warwick and the Granite Belt. In the Continental and English trade it is almost universally known as Mimosa. All the acacias, of course, are wattles, and the genus is very closely allied to the tree Mimosa botanically. According to an article in the "Gardeners' Chronicle" a couple of years ago, *Acacia podalyriæfolia,* our common Silver Wattle of Queensland, had been introduced to the South of France, and limited supplies of it were finding their way to London. The common Golden Wattle of the Brisbane district is *Acacia fimbriata.* So far as we know this last species is not cultivated in Southern Europe.

General Notes.

Staff Changes and Appointments.

Mr. James Purcell (Toowoomba) has been appointed Chairman of the Dairy Products Stabilisation Board until the 7th February, 1935.

Constable W. J. Huey (Millaa Millaa) has been appointed also an Inspector under the Slaughtering Act.

Constable W. Robinson, Officer in Charge of Police at Nebo, has been appointed also an Inspector under the Brands Acts.

Mr. J. R. Canty, Slaughtering Inspector at Innisfail, has been appointed an Inspector under the Apiaries Act.

Mr. M. A. Hannigan (Kyoomba, via Stanthorpe) has been appointed an Inspector on probation under "*The Diseases in Plants Acts*, 1929 *to* 1930," and Agent under "*The Banana Industry Protection Act of* 1929," Department of Agriculture and Stock.

Messrs F. C. Jorss, R. J. Rollston, and N. Lambert have been appointed Assistant Inspecting Cane Testers for the 1934 Sugar Season, and will be stationed at Cairns, Mackay, and Bundaberg, respectively.

Mr. I. H. Simon, Customs Officer, Maryborough, has been appointed an Inspector under the Diseases in Plants Acts, and the Apiaries Act.

The Honey Board.

An Order in Council issued under the Primary Producers' Organisation and Marketing Acts formally extends the operations of the Honey Board for the period from 9th March, 1934, until 8th March, 1939. Notice of intention to make this Order in Council was issued in January last, and a petition for a ballot on the question of the continuance or otherwise of the Pool was invited from growers, such to be lodged before 5th February last. A petition was received, and a ballot conducted, which favoured the continuance of the Pool.

Regulations have been approved under the Primary Producers' Organisation and Marketing Acts, empowering the Honey Board to levy on growers of honey and beeswax at the rate of 1½ per cent. on all honey and beeswax sold during the period from 1st April, 1934, to the 31st March, 1936, to provide for the administrative expenses of the Board. The amount of the levy shall be deducted from the proceeds of sales of honey and beeswax by agents and persons who purchase honey and beeswax from a grower, or sells these commodities on account of a grower, and the amount collected shall be forwarded to the secretary of the Honey Board not later than the seventh of the month next succeeding such purchase or sale.

On the 22nd August, 1929, approval was given for the exemptions of sales of honey by beekeepers direct to local consumers or to retail vendors in such beekeepers' district, subject to certain conditions. This action was taken pursuant to the provisions of Section 15 (4) of the Primary Producers' Organisation and Marketing Acts, which provides that the Board may in such cases and in such terms and conditions as may be prescribed by the Minister, exempt certain growers and certain of the commodity subject to the Act. The Honey Board has requested that this notice be cancelled, and approval has accordingly been given to the cancellation of the notice in question.

Honey—Places of Entry.

In pursuance of the provisions of Regulation No. 1 of the Regulations under the Apiaries Act, the Minister for Agriculture and Stock (Hon. Frank W. Bulcock) has named Innisfail and Clapham Junction as places of entry for the introduction into Queensland of bees, honey, and beekeeper's appliances.

"A B C of Queensland and Australian Statistics."

A copy of the 1934 issue of the "A B C of Queensland and Australian Statistics" has been forwarded to us by the Registrar-General (Mr. G. Porter).

This useful booklet is to all intents and purposes the Official Year Book of Queensland, and is presented under the authority of the State Government. The 1934 edition contains, in addition to the main features appearing in the 1933 issue, information relating to—(*a*) The results of sales held at the Brisbane Wool Market for the last ten years, and (*b*) the disposals of butter and cheese made in Queensland for the last five years.

The rates of taxation in Queensland and other States have been revised in accordance with amending legislation; the main points of the Main Roads Regulations and the Heavy Vehicle Regulations are revised, and points of "*The State Transport Act of* 1932" have been included.

Populations have been revised in accordance with the Census of 30th June, 1933, and per capita figures on ten-yearly tables, &c., have been adjusted.

Information concerning many phases of Production—Primary and Secondary—Finance, Labour, and Industrial matters, Vital Statistics, &c., is included.

Population.—The population of Queensland at the Census date, 30th June, 1933, was 947,789, and at the 31st December, 1933, 949,286.

Queensland's crude birth rate of 18.56 per thousand of population is the second highest in Australia, whilst the crude death rate—8.35 per thousand—was the second lowest in Australia and third lowest in the world. Only New Zealand and South Australia record lower rates of infant mortality.

Trade.—The value of Imports for 1932-33 in Australian Currency was £5,660,772, and the Exports £15,279,726, the excess of Exports being £9,618,954. The Imports and Exports per head of population were £6 0s. 4d. and £16 4s. 10d. respectively.

Finance.—The Public Debt of Queensland at 30th June, 1933, was £114,530,855—£120 16s. 10d. per capita of population. The total amount of Taxation per capita was £6 0s. 4d., New South Wales and the Commonwealth Taxation being higher.

Motor and Wireless Licenses.—At the 31st December, 1933, there were 91,435 Motor Vehicles registered, and 40,771 Wireless Listeners' Licenses were in force.

Unemployment.—For the last quarter of 1933 Queensland's percentage of unemployment—13.8—was well below that of any other State; the figure for the Commonwealth was 23.0.

Livestock.—At 1st January, 1933, there were 5,535,065 Cattle, 21,312,865 Sheep, 452,486 Horses, and 213,249 Pigs.

The Wool production of 1932-33 amounted to 185,833,546 lb. (greasy), and was valued at £6,976,501.

Agriculture and Dairying.—In 1932 the Wheat Crop amounted to 2,493,902 bushels; Maize, 1,653,853 bushels; Sugar made, 514,027 tons; Cotton (unginned), 6,270,116 lb.; Tobacco, 2,303,861 lb.; the Butter made amounted to 96,317,201 lb.

Mineral Production.—The total Mineral production was valued at £1,784,499 for 1932, including Coal, £684,555; Lead, £573,813; Silver, £182,733; and Copper, £108,858.

Value of Production.—The recorded production from all Queensland Industries in 1932-33 was valued at £47,056,142, or £50 1s. 10d. per capita of population, Primary providing £35 1s. 7d. per capita, and Manufacturing £15 0s. 3d.

These are but a few of the interesting features of the "A B C" which is now available at a nominal cost of 2s. (posted 2s. 3d.). Copies may be had upon application at the Registrar-General's Office, Treasury Buildings, Brisbane.

Regulation under Sugar Experiment Stations Acts.

A regulation under the Sugar Experiment Stations Acts has been issued which provides that the Secretary of a Cane Pest Board shall maintain at his office a register of all transactions relative to moneys due to the Board in respect of fumigants or labour supplied by the Board for the suppression of cane pests. Such register shall be open for inspection upon the payment of one shilling.

It will now be possible for any interested person to learn from the Local Cane Pest Board whether that Board had a first charge over the assets of any particular cane farmer in respect in fumigants, &c., supplied.

Rural Topics.

Chilled Beef—Opportunity for Farmers.

The recent meeting in Sydney of beef exporters and shipping representatives suggests that definite progress is being made towards the establishment, on something more than an experimental footing, of a chilled beef trade with Britain.

Technical research and actual experience both suggest that the successful establishment of the trade in New South Wales is now largely a matter of organisation. Progress will depend, however, upon the active co-operation of all those directly interested. Recognising this, exporters and shipowners have taken the initiative, and it now devolves upon the producers as a body to follow the lead thus given them.

It has been stated, in quarters not lightly to be disregarded, that a successful chilled beef trade will be impossible until a constant supply is available of cattle bred and grown to meet the special requirements of the trade. Eventually, this will become true, but meantime, fortunately for the industry, there is authority, no less trustworthy, for the definite statement that here are now in Australia ample supplies of suitable stock to warrant the commencement of commercial exports as soon as the necessary meatworks and shipping arrangements can be made. In the early stages, large shipments, even if possible, would be unwise. A demand for Australian chilled beef must first be cultivated. And, by the time an extensive demand has been created, the producers will have had an opportunity to prepare to meet it.

Since the South Americans established their practical monopoly of the most valuable section of the British market—the household supply—consumers' requirement have changed radically. Large, fat joints, such as come from big bullocks five years old and upwards, are no longer acceptable to the British housewife, who demands young beef of prime quality. The South Americans have not only met, they have actively encouraged this change in taste, because it still further increased the advantages given them by the chilling process. Australian producers, on the other hand, have not been able to keep fully abreast of these changes for the good reason that, while they remained dependent upon hard freezing, to do so was impossible economically, if not technically.

These and other barriers to progress are now, however, about to be removed, and with the help of Australia's natural advantages as a beef-producing country—and of the Ottawa meat agreements—it will be possible to meet the foreigner on level terms and beat him at his own game. To achieve this, extensive reorganisation of the methods of production will be necessary. The higher comparative prices which may confidently be expected for a higher grade product will, however, justify a considerable degree of specialisation, such as is practised in South America, and the breeding, growing, and fattening of beef for export, either as separate, specialised branches, or in combination, will again become profitable.

To secure the fullest measure of success, the producers must be guided by three principal aims: The breeding of early maturing stock of best beef type; the development of a system of feeding which will ensure unchecked progress and bring the beast to killing condition carrying a high degree of finish at between two years and three years of age, and last, but not least, continuity of supply. The first of these objectives requires no comment. Once breeders are assured of a return on their outlay in raising the standard of their herds they can be trusted not to "let the grass grow under their feet." The third objective, especially in this country, is so intimately identified with the second that separate consideration is unnecessary.

It is upon the second objective—the development of a scientific system of feeding—that the eventual success or failure of the industry depends. To attain it a great deal of work will be necessary, but in the process large numbers of farmers will find an opportunity to employ profitably suitable land at present too valuable for grazing, and otherwise not fully productive. Any successful system of feeding cattle intended for chilling will require the provision of improved natural or introduced pasturage, and, in most cases, of suitable fodder crops. Fodder conservation will also play an important part in the system, which must ensure throughout the year adequate supplies of feeding constituting a "balanced ration" designed for beef production. This is work which, in many cases, the man occupying a small area of good land in a district with a good rainfall will be able to undertake more effectively and more economically than the big grazier.

Details will vary in different States, and even in different districts, because of climatic and other factors, but, broadly speaking, these are the basic principles upon which the successful beef raising of the future must be founded. They are well within the capacity of the enterprising grazier and farmer to attain. The rewards they promise are sufficiently attractive to justify immediate action, so that the production of beef of the best possible quality may proceed progressively and contemporaneously with the exploitation of the chilling process and the cultivation of a market demand for beef ''produced in Australia.''—L.G.A., in the ''Sydney Morning Herald.''

Horse-breeding—The Choice of a Sire.

In the breeding of horses there is nothing more important than care in the choice of the sire. A definite ideal must be in the breeder's mind in relation to type. Pedigree is an essential, and purity of lineage cannot be too strictly insisted upon. The next inquiry must be for a sire possessing freedom from hereditary disease determined as the result of an examination by a veterinary surgeon. The main object of the breeder is to secure strength, and at the same time the staying power that enables a horse to do a hard day's work for a lengthened period.

The sire must be active, intelligent, and tractable, though full of determination. Beyond all dispute the best evidence of a horse's staying power and length of service in the heavy breeds is balanced action—the movement and stride that enables a horse to cover the most ground with a maximum of ease and a minimum of friction and wear. True action has a special value in both sire and mare, for where the feet are raised and placed in precise and regular form in walking and trotting, there is resistance to bone and joint troubles, and there is also lengthened service. An evenly balanced body would lose its value on ill-shaped feet, or abnormally dropped legs.

Constitution and stamina are also needed to withstand the stress of continuous work. The indications of a general nature must include a good barrel or middle piece, showing ample space for digestion, and vigorous heart and lung action. A slack-loined horse is more or less ''soft,'' and a tucked-up barrel, sometimes termed ''herring-gutted,'' also betokens lack of stamina. Ample girth, depth through the lines, and fulness at the flank all favour constitution.

It is not an uncommon thing to see a ''washy'' horse which is big in the barrel, but which with stress of work soon falls away in condition and exposes his true type with a lightness about the girth and loin. A fleshy heavy head should not be favoured; while, on the other hand, a lean head, wide in the cheek, with a good space between the branches of the lower jaw, denotes constitution, as also does the bright, lively eye and quickly-moving forward ears.

Weight and substance with a good top and quality of feather are required. The condition of the skin must be closely examined.

A good temper and kind disposition invariably accompany intelligence and good manners.

An examination of the legs, for durability, must not be overlooked, and should result in the discovery of clean, flat bone, with tendons distinct, free and clear from the bone. Sloping pasterns of medium length are desirable. The closest scrutiny should be made of the structure of the foot—a firm wide heel, strong horny crust, healthy frog, and level placing must be shown.

A general overhaul of the animal in the actions of walking and trotting affords the opportunity of estimating his character, and many features that it is impossible to outline also aid in arriving at fairly sound conclusions. A prominent breeder states that ''we should not select as a result of the animals possessing some specially good quality, but rather select him from the absence of faults and the general accumulation of harmonious and worthy qualities in disposition, conformation, and stamina.'' The exaggerated development of any single meritorious point is not compensation for some flagrant deficiency.

Performances or exhibition in the show ring do not always afford the most reliable evidence of a sire's capacity for leaving sound stock, but these, in conjunction with the proved excellence of his stock, are the best guarantees to owners of mares. The knowledge of pedigree, stoutness, prepotency, quality, weight, action, and other desirable qualifications is thus eclipsed in guiding the breeder by absolute evidence of the very best kind.—A. and P. Notes, N.S.W. Department of Agriculture.

Protein for Milk Production.

In his report on the competition recently conducted by Camden Haven branch in regard to feeding cows for production, Mr. E. O. Dalgleish, Senior Dairy Instructor, emphasised the value of protein.

The protein or nitrogenous portion of any fodder mixture is the most expensive one to provide, but it has been very truly said that the secret of milk production lies in the provision of a plentiful supply of protein. Common fodders rich in protein are lucerne, cowpeas, and vetches, and among the concentrated fodders, linseed meal.

''Balancing'' a ration means that the foods are to be mixed in such a way that all the constituents thereof can be most economically made use of by the cow. For instance, saccaline contains a large proportion of carbohydrates—sugar. If fed on a ration of saccaline only, the cow will use only such proportion of the carbohydrates as she requires, and the remainder is wasted. To ''balance'' the carbohydrates, a fodder containing more protein should be mixed with the saccaline, and the quantity of the latter reduced. A suitable fodder would be lucerne hay. Substitutes, however, could be cowpeas, vetches, red and berseem clovers. A crop which is very high in protein and which has not been tried in New South Wales to any extent is the soya bean, a crop which is grown very extensively in the United States.

The cow's natural fodder, and one which naturally provides a balanced ration, is a mixture of grasses and clovers in bloom, and if this could be provided for her all the year round would be easily the most economical method of feeding. A start in the right direction is the provision on most of the farms of areas of winter grasses and clovers. If continued and extended into a number of small paddocks on each farm these will be of incalculable benefit in time to come, when it may be possible for paspalum and clover pastures to provide grazing in the summer, with rye and clover pastures for the winter—reserves in case of necessity being provided by the pit silo.

A Useful Lick for Dairy Cattle.

Where the dairy farmer has reason to suppose that his cows are suffering from a mineral deficiency in their diet, commonly indicated by the habit of bone-chewing, he should lose no time in correcting the condition. In the case of hand-fed cows, the addition of two or three tablespoonsful of sterilised bone-meal to the feed daily will be found highly beneficial. Where the cattle are not hand-fed, a lick should be provided in troughs in the paddocks or in boxes in the milking sheds or feed stalls. This lick may be simply sterilised bone-meal itself, or if it is desired to provide the animals with other ingredients as well, including salt, the following mixture will be found of value:—

Salt	40 parts.
Sulphate of iron	1 part.
Bone-meal	10-40 parts according to the requirements of the cattle.

Soil Erosion.—A Cause of Enormous Loss.

From every conceivable angle erosion is a devastating agency. It is the greatest thief of soil fertility. It steals not only the plantfood contained in the soil, but the whole body of the soil, plantfood and all. When this productive material that required centuries in the building is washed out of fields it cannot be economically hauled back, even where it is washed no farther than from the upper to the lower slopes of fields. That which passes down into the beds of streams and on out to the ocean is lost as irretrievably as if consumed by fire. It has been estimated that erosion steals twenty-one times as much plantfood as crops take out of the land.

Surveys and soil-loss measurements indicate that at least 3,000,000,000 tons of soil are washed out of the fields and pastures of the United States every year. The value of the plantfood contained in this amounts to more than two billion dollars, on the basis of the cheapest fertilizers. Of this almost inconceivable wastage, the direct loss to the farmers of the United States of America is not less than 400,000,000 dollars every year. This is paid for in reduced acreage yields, increased cost of cultivation, fertilization, and the growing of crops for the sole purpose of building up impoverished fields, in land abandoned, highways damaged, reservoirs, irrigation ditches, and culverts choked with erosional debris, and accumulative thinning of the surface soil, the staggering cost of which is postponed until the last inch of soil is washed off.

Pig Raising.—Suitable Crops and Feeds.

Lucerne, either for grazing or for cutting and feeding in the sty, is the best green feed for the boar, sows, and young pigs. Wheat, oats, rye, and broadcast maize are also very suitable as green feeds for grazing; climbing varieties of cowpeas can be sown among the maize.

Sorghum should be fed only when mature. Rape is a fine winter crop, ranking next to lucerne for grazing purposes. Jerusalem artichokes are very hardy, and grow well in light soils. The pigs should be turned in to harvest these after the plants have flowered.

Sweet potatoes, suitable for warm districts of good rainfall, are good for pigs when fed with a small percentage of maize or other grains and skim-milk; they are utilised in the same manner as artichokes for grazing. Sugar beet and mangolds are excellent feed fed raw, and can be readily stored in a pit. Potatoes should be boiled and fed with skim-milk or maize; the water in which the potatoes have been boiled should not be given to the pigs.

Pumpkins can be largely grown; they should be fed raw. Wheat and barley should be crushed and steamed for a few hours and fed with skim-milk or whey.

With regard to mill refuse (pollard, bran, and sweepings), the market value of these determines whether it pays to feed on them or not, but a very little pollard mixed in milk keeps pigs growing and fattening well. Bran, which is properly rather a laxative than a pig food, is very useful for brood sows. Sweepings from mills, &c., should be used carefully, as they often contain a lot of rubbish. It is wise to soak the sweepings, so that any nails, nuts off bolts, or similar dangerous foreign objects may sink and be separated.

Skim-milk, butter-milk, and whey are widely used as food for pigs. Skim-milk, which should be fed with crushed grains or pollard, is a good flesh-producing food. It should not be used straight from the separator, but allowed to stand an hour or so, so that the gas may work out of it. When feeding butter-milk, always add pollard or crushed wheat, barley, or maize; otherwise the pigs will be soft and blubbery when dressed. Whey also should only be fed when mixed with crushed grains.

To avoid any chance of tuberculosis, all milk products should be boiled before being fed to the pigs.

Following is a table of crops (mostly green feeds) suitable to grow as food for pigs:—

PLANTING TABLE OF CROPS SUITABLE FOR THE PIG-RAISER.

Crop.	When to Sow.	When Available.
Barley	February to April ..	May to October
Rye	ditto	June to September
Oats	ditto	June to November
Rape	ditto	June to September
Kale	ditto	August to October
Cowpeas	September to November	January to April
Pumpkins	ditto	January to June
Maize	October to December ..	January to April
Feed Millets	ditto	December to April
Sorghum	ditto	December to May
Turnips	February to April ..	May to October
Artichokes	September to October ..	March to April
Sweet Potatoes	October to November ..	February to June
Mangolds—		
Autumn	March to April	September to December
Spring	October to November ..	May to July
Potatoes—		
Autumn	February	May to June
Spring	August to October ..	January to February
Lucerne—		
Autumn	February, March, April ..	August to May
Spring	September to October ..	Following year

A. and P. Notes, N.S.W. Dept. of Agric.

Tree-planting Time Approaching.—Preparation of the Ground.

Because their wholesale removal has been necessary in the process of land settlement, trees have come to be regarded by many farmers almost as an excrescence. There are those, however, who appreciate that trees are of considerable importance in agricultural and pastoral economy, as sources of shade and shelter, fuel, fodder, and timber, and that on the score of beauty too they have a claim to their place on the farm. Such farmers may again be reminded that planting-time is now approaching, and that the best results will be obtained if the land is well prepared.

When forestry work is carried out on a big scale it is not possible to prepare the ground for planting as thoroughly as could be desired, and very often the only preparation consists of digging a small hole, or merely inserting the plant in a wedge-shaped notch made by a spade or notching tool. The farmer, on the other hand, has only a small area and a limited number of trees to deal with, and the necessary labour is usually supplied by himself in any spare time. Moreover, he requires quick and certain results, and must therefore ensure the best possible conditions for planting. In general forestry work allowance can be made for a number of failures, but in windbreak planting, for example, a single failure is much more important. Thorough preparation of the soil is therefore necessary.

Where a number of trees are being planted together, such as windbreaks, avenues, or tree lots, the land should be first ploughed. New land should be broken up before winter and allowed to lie until planting time. A plan which has its advantages is to make the first ploughing only deep enough to cover the grass and herbage. Shortly before planting the ground should be cross-ploughed deeply, and then harrowed. Ground previously under crops will probably contain many weed seeds, and to enable the young trees to become established before the weed growth becomes unduly aggressive such land should be ploughed and harrowed, and planted immediately afterwards with the trees. Where hillside planting is being carrried out, the ploughing should follow the contour of the hills as far as possible.

Ordinary hole planting is attended with some risks, especially where the subsoil is impervious. In such cases the hole tends to become merely a pool of stagnant water and a grave for tree life. Where trees must be planted in holes, such as in the case of isolated shade, shelter, and ornamental trees, the holes should be made as large as possible. A hole 3 feet by 3 feet and 2 feet deep is the smallest size allowable, and larger holes, where possible, should be made.

Where deep digging carries the hole into an impervious subsoil, it is better to make the hole wide and shallow, the depth not exceeding that of the soil. On wet, poorly-drained soil ridges or mounds may be formed as sites for planting. Ploughing two adjoining furrows so as to throw the sods together achieves this end in a minor way. Irrespective of what method is adopted, the preparation of the land should be completed before stock for planting is obtained.

The best time for planting is when the plant is at its resting period, and when moist, cool conditions prevail. Generally speaking, May to August are the best months. The effects of frosts must be studied, and spring planting is often necessary in some localities, except for deciduous species. Where the rainfall is heavy and conditions generally are cool, the planting period may be considerably extended. A cool, cloudy day and a fairly moist soil provide ideal conditions—A. and P. Notes, N.S.W. Dept. Agriculture.

Lean Bacon in Demand.

Altered demands the world over, and a steadily increasing demand for lean bacon and ham and for fresh pork products carrying a maximum of lean meat are matters with which the pig-raiser needs to become conversant. There is no call nowadays for the thick, heavy fat pork so popular years ago, nor does it pay to attempt to force on consumers the class of bacon for which they have no appetite. In order to obtain a maximum of lean meat it is essential that the pig's rations carry a maximum of flesh-forming foods, and for this purpose nothing is better than the by-products of the dairy—skim milk buttermilk, and to a lesser extent whey, with other animal proteins like meat meal used as a supplementary or substitute for flesh formers as well as vegetable proteins in the form of pollard, pea meal, barley meal, and succulent greenfoods. Under Australian conditions the feeding of carbohydrates (fat formers) must be carried out judiciously, otherwise there will be an excess of fat and a minimum of lean meat, instead of vice versa. Whatever the system of feeding, the objective must be lean bacon, otherwise the profits will diminish and the business become unprofitable.

Silos and Silage.

Based on more than ten years' experience of silos, Mr. Alex. Smith, of Bandon Grove, gave an informative address at the recent annual conference of the Upper North Coast District of the Agricultural Bureau of New South Wales. He said:—

My experience with silos and the making and feeding of silage dates from 1922. At that time I had some oats which were not required for feed. I was anxious to try to conserve it in a succulent form. It was only a small piece, such as many coastal dairy farmers have left over in a fair season. The weather at the time made hay-making rather risky. At that time pit silos were not considered advisable on the coast, nor the making of silage in quantities less than 50 tons. I decided that it was worth while to try if these small surpluses of green fodder could be successfully conserved as silage. A pit was excavated, estimated to hold about 20 tons, and filled and covered with soil. It turned out well, and the cows were quite satisfied with it. When this very small pit was filled with maize the produce was not as good as the oat silage, but still the cows appreciated it. I consider crops such as maize or sorghum should be chaffed, as an appreciable amount of the lower end of the stalk remains uneaten. I also think it advisable to give a pit a coating of concrete over netting laid on the bottom and along the sides. Getting silage out of an unroofed and unconcreted pit in damp weather is a messy and slippery job, and a pit that is to be used permanently should have a roof.

Later on we excavated another pit right on the bank of the Chicester River, estimated to hold about 44 tons. About 2 acres of oats and field peas were put in, also half an acre of Italian rye and golden tares, and 3 acres of lucerne. The Italian rye and golden tare mixture made the best silage I have ever seen, and the oats and peas were also good. This pit was later filled with maize, and not touched for four years. Then it was partly fed out, and the remainder used two years later. This pit was under water several times, but it had no detrimental effect.

An overhead concrete silo was built in the summer of 1931-32. The silo cost £94, not charging our own labour.

The cows received 30 lb. silage per day each, and sometimes during the winter nearly 40 lb., but instead of using expensive concentrates the cows had green oats in fine weather and hay in wet weather, and, in spite of the fact that they were used to having concentrates in the winter, the production this last winter was greater than I ever remember, and we saved the expense of the concentrates.

We have now made silage from crops at all stages of growth from before tasselling till nearly hard grain stage, but prefer to make maize silage when the grain is in the milk stage. When made at a later stage it is our experience that the grain passes through the alimentary canal of the cow unused and is, therefore, a dead loss. There is a better distribution of nutriment throughout the whole plant at the milk stage than at any later stage and it is in a more digestible and easier assimilable state.

A few years ago an Englishman at the School of Animal Nutrition, Cambridge, England, got the credit for the discovery that pasture plants in the leafy stage had a far greater feeding value than the same plants after they had started to produce stems and seed heads. I think our own Department of Agriculture should get the credit for this discovery. An article which appeared on page 657 of the "Agriculture Gazette of New South Wales," September, 1919, will bear out what I say. The credit of the discovery belongs to the New South Wales Department of Agriculture; the credit for emphasising it belongs to the Cambridge people. The grassland experts emphasise the importance of making silage from plants in the leafy stage.

The British Ministry of Agriculture recognises four types of silage:—

(1) *Sweet, Dark-brown Silage.*—Made when the material heats up too much and the temperature rises above 113 degrees Fahr. Factors contributing to this are a comparatively dry crop, either one that is dry from being mature, or from being allowed to dry somewhat after being cut. Such dry crops facilitate fermentation, both because they do not pack so tightly and thus allow air to penetrate the silo readily, and because the heat that is generated by fermentation has comparatively less moisture in the silage to heat, and consequently the temperature rises more.

(2) *Acid, Light-brown or Yellow-brown Silage.*—When less air is allowed to intrude than above, and the material does not heat up so much, this type commonly occurs (temperature range 86 to 104 degrees Fahr.). As a rule there is not much juice expressed from the silage when this type is being made. Acid brown silage is commonly made in pit and trench silos. This silage has a yellow-brown colour,

and an acid, though pleasant, smell, largely due to the presence of acetic acid, the yellowish types having the more pleasant smell. It is readily eaten by stock, which thrive upon it, and it is to be recommended. This is the most common form made, and it is much superior to the sweet, dark-brown variety.

(3) *Green "Fruity" Silage.*—Usually this quality is only made by chance, and it is hard to control conditions so as to make it with certainty. It is made by rapidly building fresh lush, leafy grass (temperature about 86 degrees Fahr., but no higher). This type has a green to olive-green colour, and a smell that is delicious —neither sweet nor sour—and is best described as "fresh" and "fruity." It is greedily eaten by stock, and it has recently been shown that its digestibility is very high. It has one disadvantage—much juice is lost.

(4) *Sour Silage.*—Sour silage has generally a dark-brown or olive-brown colour, and a pungent and very unpleasant smell, due largely to the presence of an acid. It is commonly made when a very immature and succulent crop is ensiled. In this case the watery fodder packs downs very closely in the silo and excludes the air to such an extent that little heating is possible. Thus crops of immature maize often give rise to sour silage. Again, sour silage is frequently found at the bottom of trench silos—especially if the material has been carted in wet weather, because the trampling of horse and cart over the trench, as well as the superimposed weight of silage, squeezes out the air and limits fermentation. Such defects may be obviated and the sourness reduced if the making of the silage proceeds slowly so that a certain amount of heating may occur in each layer of 3 or 4 feet before the next layer is put on. This sour silage has a high feeding value, and is quite palatable, despite its unpleasant smell.

In filling the silo, proper consolidation, by trampling, is, of course, important, but no less important is proper distribution. If this is not attended to the lighter and looser material, such as the leaf, is apt to fall in one area and a nest of mould is likely to develop.

Points in Citriculture.

Speaking at the annual conference of the Upper North Coast District of the Agricultural Bureau of New South Wales, Mr. K. D. McGillivray, of Moorland, said:—

I ask you to accept me as your guide on an expedition into the mind of an orchardist, hoping that we may see something of his mental processes and, if our understanding is keen enough, we may even catch a glimpse through his eyes, seeing things as he sees them.

The commercial orchardist's first duty to his trees is to practise a system of cultivation, manuring, and pruning that will ensure soil fertility and will encourage desirable cropping habits. The measure of his success, then, largely depends on his attention to pest control. An orchard pest is a living thing—belonging either to the animal or the vegetable kingdom—that interferes with the growth of trees or the production of high-grade fruit. The commercial grower must know how to deal with his pests.

The satisfaction that attends the growing of clean, healthy trees and clear-skinned fruit of good quality should be enough to encourage the non-commercial grower, who grows mainly for home use, to learn something of pest control. The appearance of the trees near his home and the health of his family would be expected to interest him, apart from other considerations.

If there is no appeal to him in these things perhaps he may have a sense of fairness and realise that by attending to pest control he will be getting rid of a centre of infection that may have been making life a burden to a man who is trying to make a living from fruitgrowing. If you have unhealthy trees you do not know how far the pest is spreading. If the home grower of fruit is still indifferent he may find himself in conflict with the Plant Diseases Act. The inspectors appointed under this Act have wide powers, and heavy penalties can be inflicted for neglect to comply with the regulations.

The gradual expansion of commercial citrus-growing on the North Coast makes this subject of special interest, and makes is imperative that owners of farms on which more or less neglected citrus trees are growing should make some effort to clean them up. What would a dairyman do to an orchardist who owned a diseased bull which he allowed to roam the district, or who sold milk and butter not being a registered dairyman? What can an orchardist do to a farmer whose neglected trees are breeding and spreading pests and who is unloading the product on to local markets—some of it good fruit, some inferior—and much of it being sold at prices that show no knowledge of market values? Due largely, perhaps, to the less organised

condition of orchardists, the law cannot give him similar protection to the dairymen. He can have the Act enforced, compelling the control of some pests and the destruction of some trees, but he cannot eliminate unfair competition. The orchardist does not deny the farmer the right to sell his surplus fruit, but he does think that the farmer should at least pay some attention to pest control and should learn something of market values. Grown without cost, any price may seem to be all profit, but that state of affairs cannot last. The commercial orchardist cannot afford to allow it to continue.

Mr. McGillivray had with him a number of diseased and pest-ridden specimens of citrus fruit and foliage, and he described the best measures of control or prevention for the different pests and diseases. Dealing with fruit flies, he said that these pests were well known on the coast—if not in the winged stage, then as grubs in peaches. Fruit flies could be controlled by systematic picking up and destroying of fallen fruit and by the use of traps or foliage poison sprays. They had a sympathetic ally in the loquat tree, the relationship between the two comparing to that existing between the blackberry and the rabbit. The loquat tree provided a breeding place that carried the fly through the winter and gave it an early start in the spring. Unlike most other fruits, loquats did not fall to the ground when infested with the fruit fly maggot and, consequently, the opportunity of burning, boiling, or burying the pest did not present itself.

Mr. McGillivray concluded by urging them not to leave old, unproductive fruit trees of any kind on the farm to die a lingering death, infested with every known pest. Treat useless trees with an axe, was his advice, and apply pest control measures to those that are producing fruit.

Care of Pig Weaners.

Weaning time is a very critical period in the life of a pig. If the young pig has been given feed in addition to what it has received from the mother it should have made a good start and should then be fed, at least twice daily, all that it will eat up clean. The young pigs should have the run of good fresh pasture if possible, and should be fed on crushed grains, pollard, and skim-milk, with lucerne, rape, or barley as green feeds, or pumpkins, mangolds, &c., if possible. All slop feed should be fed while sweet, and should preferably be given warm, after having been steamed for about four hours. The steaming of such grains as are given is attended by better results than merely soaking.

The pigs should have a shallow wallow (preferably of concrete) in which the water is kept as fresh as possible. Wood ashes, cinders, and a piece of rock salt should be available in the yards, which should be provided also with a dry shelter shed and bedding. Too many pigs should not be kept in one yard. When about three to three and a-half months' old any boars that may have been kept should be separated and placed in different small paddocks, where they should be kept until ready for penning prior to marketing as porkers or baconers.

An important point is always to have the pigs graded, so as to keep the same sized animals together, thus preventing large pigs from jostling the smaller ones at the feed trough. Pigs will be found to do much better if a system of grading is in force. Approximately forty pigs can be run to the acre, but the exact number will depend upon the size of the animals and upon the pasture provided.

To Remove Hair from Hides.

Soak the hide in fresh water, if it is a dried one, to which a few handfuls of washing soda have been added, until the hide is quite limp and soft as a fresh hide. Remove all scraps of fat, flesh, &c., and rinse once or twice.

Now put the limp hide in a solution of unslaked lime and water, in the proportion of 2 to 4 oz. of lime to the gallon. Soak for twenty-four hours; the hair should then come out. If not, make up a fresh liquid and soak again, when the hair will come away from the skin readily by scraping with a blunt instrument. Give the skin two or three soakings and rinsings to free it from any lime, and then spread out to dry in the shade.

Before the skin is quite dry, rub in a little mutton fat or tallow and work the skin well. It will then be soft and pliable when dry; this will make what is called "greenhide." Omit the fat or tallow if the skin is to be tanned.—"Journal of Agriculture," Western Australia.

Harvesting of Tobacco.

Much of the trouble encountered by the tobacco-grower when selling his tobacco is due to mistakes made at the time of harvesting. It is essential, writes the Tobacco Expert of the Department of Agriculture, that only leaf which is at the right stage of maturity should be picked for treatment by the flue-curing process. No method of curing will rectify harvesting at the wrong stage.

It will be observed that all the leaves on the plant do not ripen at the same time, but that in all cases the leaves start to mature from the bottom upwards. To secure the best results, and obtain an even cure, each leaf should be taken off separately as it reaches maturity. This, briefly, is what is meant by "priming."

The leaves are then placed in baskets or other suitable receptacles and taken straight to the barn to be strung in the shade, care being taken that after "priming" they are kept out of the sun as much as possible.

The leaves are then made up into "hands" containing four leaves each. A 4-feet stick will take about twenty "hands," ten on each side. In each "hand" of four leaves two should face one way and two the other, the middle two having their backs together. When the tobacco is to be flue-cured, the "hands" should not be jammed up close together, but there should be a space of a few inches between each on either side of the stick.

The method of stringing it is somewhat difficult to describe. The stem-butts of each "hand" are strung with a twist of the string, to hold them together. The string, which is about twice as long as the stick, is held fast permanently at one end by being pressed into a slit in the wood, and when the required amount of tobacco has been strung, the loose end of string is run through another split at the other end, and made secure. The grower quickly finds out how it is done, after a trial or two.

Hanging may also be carried out by threading each leaf with a needle and twine through the midrib, but the process is a tedious one. Yet another method is to put fixed wires through the curing stick 7 inches apart and so that they project 5 inches on each side. The leaves can be hung on the wires by piercing through the stem-butts. Leaf so strung is very liable to damage by tearing when the stick is being handled, and it is not possible to bulk down without removing the leaves from the wires.

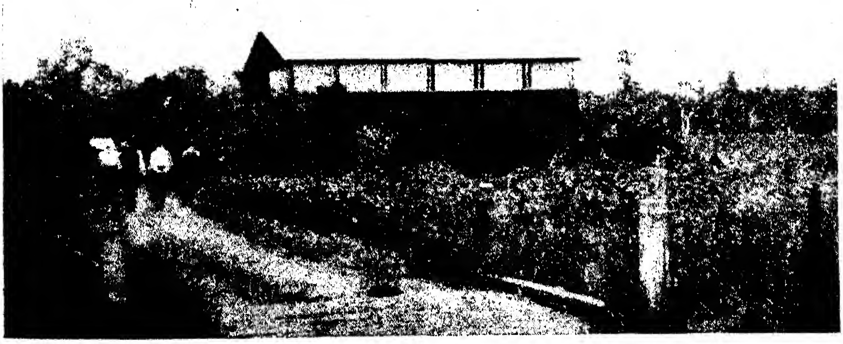

PLATE 139.
A cotton farmer's home, Theodore, Dawson Valley.

The Home and the Garden.

OUR BABIES.

(Issued by the Queensland Baby Clinics.)

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

THE STORY OF SUGAR IN THE HUMAN BODY.

NOT the least of the marvels revealed by science is that of the activities of sugar in the human body. Sugar is always present in the blood, but in extremely small quantities—very nearly one part in a thousand. Yet if this proportion is lessened the subject loses muscular power, becomes faint and, if the proportion is still less, falls unconscious and speedily dies. For sugar in minute proportion is absolutely necessary to maintain the life of all his tissues, and in its absence the first to fail are the cells of the brain. But the proportion of sugar in the blood in health is strictly limited. Should it rise above two parts in a thousand the excess passes off in the urine. If the proportion persists above this level, he is a sick man. He is suffering from diabetes, a serious and often fatal disease.

Sugar is rapidly absorbed into the blood when taken in food, but the main portion in the blood is derived from starch, which is eaten in the form of bread, potatoes, and other common foods. This starch is slowly converted into sugar during the process of digestion. Sugar, therefore, enters the blood during and after meals, but is always being gradually used up by the living body, or more rapidly by violent muscular exertion, or in the production of heat when the body is exposed to cold. As sugar enters the blood in comparatively large quantities and is being used up, often very slowly, during the intervals, how is its quantity in the blood kept fixed within such narrow limits?

There is a large gland deep in the abdomen known as the sweet-bread or pancreas. This secretes a fluid which takes a very important part in the digestion of food. But inside this gland are a number of little islands of a tissue which has quite a different function. They secrete a substance necessary for the continuance of life. This substance has recently been obtained from the pancreas of freshly-killed animals, and to it has been given the name "insulin." It has the marvellous property of converting the excess sugar in the blood into animal starch (glycogen), which is stored up partly in the muscles, but chiefly in the liver, and so rendered harmless. From these stores the sugar necessary is gradually released into the blood as it is needed.

Sugar may Cause Disease.

When the pancreas has been damaged by disease, it is unable to secrete sufficient insulin, and the man suffers from diabetes. By injecting small daily doses of insulin under the skin the excess of sugar in the blood can be prevented, and with very careful treatment the man may continue for many years in good health and capable of active work. He

is not cured of his disease, but its bad effects are prevented. In nearly all cases he has to continue his insulin injections to the end of his life. If he takes too little insulin his diabetes returns; if he takes too much (and it is often difficult to regulate the quantity) he becomes weak and faint, and unless he takes a good dose of sugar (which is strictly forbidden to the diabetic under ordinary circumstances) he may fall unconscious and die.

Use and Abuse of Sugar.

The self-protective powers of a healthy body are wonderfully elastic. They are sufficient against all ordinary contingencies. On a natural diet sugar is taken much diluted in milk, in fruit, or in the juices of some vegetables such as sugar-cane. Starchy foods are slowly digested, and impose no sudden strain on the tissue that secretes insulin. But pure concentrated sugar is an artificial product. Added to other foods in small quantities it is harmless and valuable. Taken in large quantities, its rapid absorption imposes an unnatural strain on the insulin-producing cells of the pancreas. Unless these are in a vigorous and healthy condition, serious harm may result. Diabetes is becoming an increasingly frequent disease among people of the British race.

There are rare conditions in which pure sugar is the best restorative. Among these is the athlete who is "all-in" after excessive muscular strain—the marathon runner, for instance. Some patients with degenerated heart muscle may stave off death for a time by increased sugar consumption; their urgent need justifies the risk. There are a few children who suffer from faint turns from decrease in their blood sugar. The most reasonable explanation is that their "islands" have been so stimulated by eating sweet things that they do not stop secreting insulin even when it is not wanted. These children need careful and prolonged medical supervision and treatment. Whether they are candidates for future diabetes is not yet known, but it is possible.

Sugar is therefore a food capable of causing serious harm when taken in excess. We have not here space to dwell on the serious conditions which have been revealed by the school dentists. It is pitiful to see children spending their pennies in destroying their teeth. Nor can we narrate how the over-eating of sweet and starchy foods has been found to diminish their power of resistance to infections. As a sugar-producing State Queensland has a special interest in these matters, for any attempt to increase the consumption of sugar beyond the limits of health is likely to recoil on the industry.

THE CHILD AT SCHOOL.

How to Care for His Eyes.

Miss Stella Pines, in a recent issue of the "Bureau Record" (Agricultural Bureau of New South Wales), writes:—

IT does not matter whether the child has his own governess, whether he has his lessons by correspondence, or whether he goes to a formal school or not, every day is a school day, for he is learning from example through his environment.

In the public schools, the school medical officer and the school nurse see every child at least once a year, and his defects are listed, and follow-up work is carried out to get the co-operation of the parents in having these defects rectified.

Just as the baby has every right to be given a good inheritance and be cared for in his helplessness, so the child of pre-school and school age needs a good overhauling every year to see that his body, both mentally and physically, is fit for the burden of everyday education, whether it be arithmetic, reading, spelling, or any of the other subjects, or that most precious of subjects, his health.

Because the child is growing, eating, and sleeping he may not be getting the best out of life or making the best use of his mind, for the simple reason that he may have a defect of hearing or his sight may be getting gradually worse, due to nearsightedness or farsightedness, and the harm may not be realised until a decided abnormality becomes apparent.

What can parents far out in the country do in order to know these things?

First of all, if your child does go to school, see that all defects pointed out by the nurse or medical officer are rectified as early as possible. But is quite a long time from his baby helplessness to the school age of five, six, or seven, and much can happen in that time. If, at any time, the bush nurse should visit you or the doctor should be called in for any one member of the family, take this opportunity, when the patient is convalescent, to have the whole family, including father and mother, overhauled, but especially the little run-about, for it was through the defects of children entering school for the first time that it was recognised that physical examination should be a necessary part of the school programme.

So much has been written of the child before he is born and in his first year that we will not spend much time except to give a few details. The younger the child the more easily he will learn good habits, for he will not have the difficult task of breaking bad ones to have them replaced by the good; so begin early and get your child ready for school. The best time to begin is, of course, before he is born, and it is through the mother's health that this is accomplished. His right is to be born healthy, and then to be taught to live healthily. For the first year he is dependent upon his parents, and if he learns good habits during this time, regularity in feeding, sleeping, and elimination, if he is given the right kinds of food at the right time, has plenty of fresh air day and night, is clothed properly, and has sufficient exercise, he has the best foundation for his school life.

When he begins to run about he becomes a social little being, and it is at this time that he begins to poke into everything, becomes a regular little busybody and wants to know the whys and wheres of everything. He still needs to be fed regularly, and all the other rules of health.

Is He Looking at the World the Way He Should?

His eyes are one of his most precious possessions, and defects are frequently overlooked. The child with defective eyesight does not know he does not see well, for he sees as he always does. See if the child looks at you or his toys with both eyes alike, or whether he squints; if he does, the good eye does all the work and the other gets weaker for want of use. Observe if his lids are red, or if there is any watery discharge, if he avoids light, or if he holds things far away or too close. All these things should make you suspicious, and he should see a doctor, not just a man who fits glasses. You can easily test your child out by having him read certain things at different distances and of different sizes, first covering one eye and then the other.

For the school child, observe him when he is doing his lessons. See if he makes frequent mistakes with letters or figures. He may complain that things look blurred, he may again say he has frequent headaches, or that he has pain in his eyes, or he may again hold his books far away or too near. See that he has a good light to read by, especially at night. He should be encouraged to sit where the light comes in over his left shoulder, and he should never be allowed to read out in the sun with the sun striking the book itself. He should not be allowed to read lying down, except in a good light, when he is lying face down as children love to do. A shade should be worn to protect him from any very bright lights, and the light should not shine directly into the eyes.

Because a child has been fitted with glasses this year they will not last him a lifetime, for as he grows his eyesight changes and he needs his glasses adjusted periodically. A poor report from school should always receive the attention of the parents and the cause found for it.

Prevent Accidents.

A few words about preventing accidents to the eyes. Never allow a child to play with sharp-pointed instruments, as they are apt to slip, and the child plays so intently that he is mostly leaning over the objects of his play. Teach him the

right use of scissors, and other pointed things, for many a child has had injury to the eyes through trying to open a bottle or something of the kind with a fork or scissors or knife.

Teach him the right way of playing with fireworks, how to protect their eyes from fire and great heat, very bright glares, and, above all, not to play with explosives and lime. Within twelve months I have come across three children, one completely blind, and the other two with just the faintest glimmer of eyesight, through playing with lime in bottles.

Teach a child who wears glasses how to protect them, and always to walk into a darkened room with his hand before his face so as to protect his glasses.

If at any time one of the family should meet with an accident to the eyes or get a piece of metal in them, move heaven and earth to get him to a doctor.

Mothers far back in the country away from help when a child is born, should see that his eyes are well cleaned at birth. If your doctor or nurse is there they will attend to this, but there are times when there is only a neighbour or perhaps a husband, so have ready some cotton wool and cool, boiled water, and wipe each eye separately from the nose outwards, with separate cotton wool balls, and if one eye should at any time become infested be careful to protect the good one.

Do not wipe a child's eyes with your handkerchief, especially when you have a cold. "Safety first" and "prevention" should be the watchwords of your treatment of your school child.

IN THE FARM KITCHEN.

A Cleanser for Kitchen Use.

Ingredients.—1 cake sand soap; 1 small packet Lux; 1 packet soap powder; ½ cake of either Sunlight or Lifebuoy soap; 7 cups water.

Method.—Powder sand soap and mix with soap powder and Lux and shave the soap. Boil all together for seven minutes; stir well all the time it is boiling as the sand soap goes to the bottom of the vessel. Take off fire and stir till it cools. Put in tins. This makes a good quantity.

Home-made Soap.

Ingredients.—5 lb. clear fat, free from salt; 1 lb. caustic soda; 8 quarts of rain water; 1 lb. resin, finely crushed; ½ cup borax; 1 cup of kerosene; 1 small packet of Lux.

Method.—Put all materials into a kerosene tin at the same time, and bring to boiling point. Then simmer for about two or three hours, on side of stove; the mixture should then be of the consistency of honey. Prepare moulds by wetting with cold water, stir well, and turn the mixture into them cover up, and stand for two days. Turn out and cut into bars, put on shelf to dry, and turn occasionally so as to ensure drying evenly.

Caution.—When bringing to the boil, stir frequently and watch closely or the contents will boil over quickly. A good vessel for mould is to cut a kerosene tin lengthways which will make two.

Table Salt.

Take 2 cups common salt, rolled finely. Then add 1 tablespoon cornflour and mix thoroughly.

If liked a little finer add a little more cornflour.

Articles Made from Flour Bags.

Flour bags can be made use of for a number of purposes on the farm.

Four 50-lb. flour bags make a kitchen tablecloth.

One 50-lb. flour bag makes a kitchen apron.

One 25-lb. flour bag makes a child's play apron.

One 25-lb. flour bag makes a pair of rompers.

To remove the letters or printing from the bags, wash newness out, soap well, put in cold water with a handful of washing soda and boil; then rinse well.

Lemon Trifle.

(1) Put water and sugar on to heat. Blend the cornflour with the juice from the lemons and grate the rind from two of the lemons.

(2) Add the grated rind and the blended cornflour to the water and sugar and bring to the boil. Cook gently for two minutes, stirring all the time.

(3) Allow to cool slightly, then add the beaten yolks of eggs. Cook carefully without boiling.

(4) Make a pyramid of sponge cake in a glass dish. Sprinkle some crushed ratafias over it.

(5) Pour the cool lemon mixture over the cake and allow to become quite cool.

(6) Beat the whites of eggs to a stiff froth and fold in four large tablespoons castor sugar. Decorate the trifle with this meringue. Sprinkle with chopped nuts.

Ingredients.—1 quart water; 4 eggs; 4 lemons; 2 tablespoons cornflour; 1 cup sugar.

Lemon Fluff.

(1) Put the milk to heat, then add the blended cornflour and sugar. Bring to the boil and cook three minutes.

(2) Cool slightly, stirring occasionally, and when cool add the juice of two lemons and the whites of eggs, stiffly beaten.

(3) Stir the mixture well. Wet a plain mould and decorate it with the lemon cut in thin slices. Pour in the fluff and when cold turn into a glass dish. Serve with boiled custard made from the yolks.

Ingredients.—1 pint milk; 2 tablespoons cornflour; 3 tablespoons sugar; 3 lemons; whites of 3 eggs.

Orange Delight.

(1) Bring sugar and water to the boil, add the cornflour, blended with the orange juice, and the grated rind of one orange.

(2) Cool a little, then add stiffly beaten whites of eggs and beat rapidly till white and foamy.

(3) Pour into a wet mould and serve with boiled custard.

Ingredients.—1 cup sugar; 2 good tablespoons cornflour; 1 pint water; 2 oranges; whites of 2 eggs.

Lemon Meringue Pie.

(1) Line the sides of the pie dish with the pastry.

(2) Put the sugar and water on to heat, pour in the blended cornflour and cook five minutes.

(3) Add the grated rind of one lemon and the juice of three lemons.

(4) Cool a little, then add the beaten yolks. Mix well.

(5) Beat the whites stiff, then fold them very carefully into the mixture.

(6) Put into the pie dish. Make a lattice of pastry strips over the top. Bake 20 to 25 minutes in a moderate oven.

Ingredients.—½ lb flaky pastry; ¾ pint boiling water; 3 lemons; 2 eggs; 2 tablespoons cornflour; 1 cup castor sugar.

Orange Pie.

(1) Beat the yolks with the sugar, add 1 tablespoon butter, then the juice of the oranges, and lastly the milk.

(2) Bake in a pie dish.

(3) When cooked, set to cool, then pour over it the whites stiffly frothed and sweetened, and place in the oven to brown.

Ingredients.—Pulp and juice of two oranges and a little of the grated peel; 3 eggs; 1 cup sugar; 1 cup milk.

Orange Cake.

(1) Beat butter and sugar to a cream. Then add eggs one at a time and juice and rind of oranges.

(2) Lastly the dry ingredients and bake in a moderate oven 40 minutes.

Ingredients.—1 cup sugar; 1½ cups flour; ½ cup butter; 3 eggs; 1½ teaspoons baking powder; juice of two naval oranges and rind of one.

Mandarin Jam.

(1) Cut fruit finely, peel lemons and cut finely.

(2) Boil till tender with the 5 pints of water.

(3) Stand aside till quite cold, add sugar and boil till jellies, about 1½ hours.

Ingredients.—20 thorny mandarins; 5 lb. sugar; 5 pints water; 2 lemons.

Mixed Citrus Marmalade.

(1) Cut up the fruit overnight and soak it in all the water.

(2) Boil next morning until tender. Then add a pint of boiling water and lastly 10 lb. sugar.

This makes a rich jellied marmalade which is simply delicious.

Ingredients.—4 mandarins; 3 grapefruit; 2 naval oranges; 2 lemons; 10 pints water; 10 lb. sugar.

Lemon Jam.

(1) Cut lemon finely and stand over night with the cups of water.

(2) Boil till tender, then add sugar and boil fast till jellies.

Ingredients.—1 medium-sized lemon; 1 cup sugar; 2 cups water.

KITCHEN GARDEN.

Cabbage, cauliflower, and lettuce may be planted out as they become large enough. Plant asparagus and rhubarb in well-prepared beds in rows. In planting rhubarb it will probably be found more profitable to buy the crowns than to grow them from seed, and the same remark applies to asparagus.

Sow cabbage, red cabbage, peas, lettuce, broad beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds, such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted; and in cool districts horse radish can be set out.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

A REMINDER TO ONION GROWERS.

Onion seed growers should, by this, have gone through their selected onions with the object of picking out the best keepers for the production of seed. The bulk of these onions should have been selected, previous to storing, for early maturity and variety characteristics. At the final selection bulbs that are soft or prematurely shooting, or those showing any indication of being bad keepers, or that are diseased, should be discarded.

The bulbs should be planted in rows at least 3 feet apart and spaced 2 feet apart in the rows. A handy position well protected from the boisterous winter winds should be selected for the growing of onion seed.

THE FARM VEGETABLE GARDEN.

The question of drainage should be considered in relation to all classes of soil, but especially in relation to those that are at all heavy. Neglect to make the necessary provision on such soils explains many failures to get good results from them during the winter months. Now is the time to think of the question of treatment.

Briefly, the objects of drainage are (1) to enable as much water as possible to percolate through the soil, and (2) to prevent the lodgment and stagnation of water on the soil surface by enabling excess quantities of water to be carried away with ease. It is especially necessary, of course, to drain clay soils. If water is allowed to remain on these for long they tend to "puddle," but if the water is drained away the soil does not become so compacted, retaining, instead, a more friable (crumbly) and porous condition.

Drainage may be of two kinds—surface or underground; the latter is the more effective, but it entails more labour and expense. A simple surface drainage scheme consists of shallow trenches running between plot and pathway, and connected up to an outlet at a suitable point. A modified form of surface drainage is expressed in a system of raised beds. Where some form of drainage is necessary, and the installation of the underground system is impossible, either of these methods is to be commended.

Underground drainage necessitates a considerable amount of trench digging. On what plan it is advisable to set out the drains will depend upon the size and contour of the area. In some cases a herring-bone design may be applicable, the main trench forming the backbone, so to speak, and running through the lowest portion of the land and the smaller contributory trenches spreading upwards from this. In other cases it may only be necessary to feed the main trench from one side, while in others again main trenches may best be laid at the edges of the area and fed from the centre. These trenches may then be partially filled with broken stones, and the surface of the filling protected with a layer of tin or brushwood, so that the earth with which it is subsequently overlaid may not drop through and destroy the porous character of the filling.

A drain provided with this rubble filling is usually the most convenient to make, and is quite effective; but a roughly-built conduit or channel may take the place of the broken stones, if desired. This may be made of flat stones or bricks, or (failing either of these) of boards. Only the sides and top need be formed of these materials, the trench floor serving for the bottom. The stones or bricks, or whatever is used, should only be loosely laid together, so that water may fall into the trench through them and be carried off. In country gardens, where saplings are easily available, these may be used effectively in the bottom of the trench (say a foot deep), covered by a 6-inch layer of brushwood.

The depth at which the drain should lie will depend upon the class of soil, but, needless to say, it should be sufficiently deep to allow of cultivation above it. If there is difficulty in arranging this the scheme should be so adjusted that the drain runs underneath the garden pathways, and not under the beds proper; 2 ft. 6 in. to 3 ft. is usually a satisfactory depth at which to lay a drain in the ordinary household plot.

There is little necessity for drainage on sandy soils, but gardeners working on land of a heavier character should set to work now to repair any deficiency in this direction. If the contour of the plot is regular it is not necessary to do the work all at once. As a section of the plot becomes vacant opportunity may be taken to carry out drainage work on it prior to preparing it for another planting. Then, when each section of the garden has been dealt with, the scheme can be connected up.—A. and P. Notes, N.S.W. Department of Agriculture.

Farm Notes for June.

FIELD.—Winter has set in, and frosts will already have been experienced in some of the more exposed districts of the Maranoa and Darling Downs. Hence insect pests will to a great extent cease from troubling, and weeds will also be no serious drawback to cultivation. Wheat sowing should now be in full swing, and in connection with this important operation should be emphasised the necessity of at all times treating seed wheat by means of fungicides prior to sowing. Full directions for "pickling" wheat by copper carbonate treatment are available on application

to the Department of Agriculture, Brisbane. Land intended for the production of early summer crops may now receive its preliminary preparation, and every opportunity taken advantage of to conserve moisture in the form of rainfall where experienced; more particularly so where it is intended to plant potatoes or early maize. Where frosts are not to be feared the planting of potatos may take place in mid-July; but August is the recognised month for this operation. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes, yams, and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them under cover and in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn, or in the open if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size, and finally cover with either straw or fresh hay. The sand excludes the air, and the potatoes will keep right through the winter. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas.

Cotton crops are now fast approaching the final stage of harvesting. Growers are advised that all bales and bags should be legibly branded with the owners' initials. In this matter the consignor is usually most careless, causing much delay and trouble in identifying parcels, which are frequently received minus address labels.

Orchard Notes for June.

THE COASTAL DISTRICTS.

THE remarks that have appeared in these notes for the past two months apply in a great measure to June as well, as the advice that has been given regarding the handling, grading, packing, and marketing of the citrus crop still holds good. As the weather gets cooler the losses due to the ravages of fruit flies decrease, as these insects cannot stand cold weather, and consequently there is only an odd one about. The absence of flies does not, however, permit of any relaxation in the care that must be taken with the fruit, even though there may be many less injured fruit, owing to the absence of fruit-fly puncture, as there is always a percentage of damaged fruit which is liable to speck, which must be picked out from all consignments before they are sent to the Southern States if a satisfactory return is to be expected. If the weather is dry, citrus orchards must be kept in a good state of tilth, otherwise the trees may get a setback. Old worn-out trees can be dug out and burnt; be sure, however, to see that they *are* worn out, as many an old and apparently useless tree can be brought round and made to bear good crops, provided the trunk and main roots are still sound, even though the top of the tree is more or less dead. The whole of the top of the tree should be cut off and only the trunk and such sound main limbs left as are required to make a new head. The earth should be taken away from around the collar of the tree, and the main roots exposed, any dead roots being cut away and removed. The whole of the tree above ground and the main roots should then be dressed with a strong lime sulphur wash or Bordeaux paste. The main roots should be exposed for some time, not opened up and filled in at once. Young orchards can be set out now, provided the ground is in good order. Don't make the mistake of planting the trees in improperly prepared land—it is far better to wait till the land is ready, and you can rest assured it will pay to do so in the long run.

When planting, see that the centre of the hole is slightly higher than the sides, so that the roots, when spread out, will have a downward, not an upward, tendency; set the tree at as nearly as possible the same depth as it was when growing in the nursery, cut off all broken or bruised roots, and spread those that remain evenly, and cover them with fine top soil. If the land is dry the tree should then be given a good watering, and when the water has soaked in the hole can be filled up with dry soil. This is far better than watering the tree after the soil has been placed round it and the hole filled up. Custard apples will be ripening more slowly as the nights get colder. If the weather becomes unduly cold, or if immature fruit is sent South, the fruit is apt to turn black and be of no value. This can easily be overcome by subjecting the fruit to artificial heat, as is done in the case of bananas,

during the cooler part of the year, when it will ripen up properly and develop its flavour. Grade custard apples carefully, and pack in cases holding a single layer of fruit only for the Southern markets.

Pineapples, when at all likely to be injured by frost, should be protected by a thin covering of bush hay or similar material. The plantation should be kept well worked and free from weeds, and slow-acting manure, such as bonedust or island phosphates, can be applied now. Lime can also be applied when necessary. The fruit takes longer to mature at this time of the year; consequently it can be allowed to remain on the plant till partly coloured before gathering for the Southern markets, or can be fully coloured for local use.

Banana plantations must be kept worked and free from weeds, especially if the weather is dry, as a severe check to the plants now means small fruit later on. Bananas should be allowed to become full before the fruit is cut, as they will carry all right at this time of the year; in fact there is more danger of their being injured by cold when passing through New England by train than there is of their ripening up too quickly.

Bear in mind the advice given with regard to the handling, grading, and packing of the fruit. It will pay you to do so. Land intended for planting with bananas or pineapples during the spring should be got ready now.

Strawberries require constant attention, and, unless there is a regular and abundant rainfall, they should be watered regularly. In fact, in normal seasons an adequate supply of water is essential, as the plants soon suffer from dry weather or strong, cold westerly winds. Where not already done, vineyards should be cleaned up ready for pruning—it is, however, too early to prune or to plant out new vineyards.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

ALL kinds of deciduous fruit trees are now ready for pruning, and this is the principal work of the month in the orchards of the Granite Belt area. Don't be frightened to thin out young trees properly, or to cut back hard—many good trees are ruined by insufficient or bad pruning during the first three years. If you do not know how to prune, do not touch your trees, but get practical advice and instructions from one or other of the Departmental officers stationed in the district. In old orchards do not have too much bearing wood; cut out severely, especially in the case of peaches, or you are likely to get a quantity of small unsaleable fruit. There are far too many useless and unprofitable fruit trees in the Granite Belt area, which are nothing more or less than breeding-grounds for pests, such as fruit fly, and are a menace to the district. Now is the time to get rid of them. If such trees are old and worn-out, take them out and burn them, but if they are still vigorous, cut all the tops off and work them over with better varieties in the coming season—apples by grafting in spring and peaches and other stone fruits by budding on to young growth in summer. Planting can start now where the land is ready and the trees are to hand, as early-planted trees become well established before spring, and thus get a good start. Be very careful what you plant. Stick to varieties of proved merit, and few at that, and give so-called novelties and inferior sorts a wide berth. Take the advice of old growers, and do not waste time experimenting with sorts that have probably been tested in the district and turned down years ago. When land is intended for planting this season, see that it is well prepared and well sweetened before the trees are put in, as young trees seldom make a good start when planted in sour and badly prepared land.

Slowly acting manures—such as bonedust, meatworks manure, or island phosphates—can be applied now, as they are not liable to be washed out of the soil, and they will be available for the use of the trees when they start growth in spring. Lime can also be applied where required. Badly drained land should be attended to, as no fruit trees will thrive with stagnant water lying round their roots.

On the Downs and Tableland all kinds of fruit trees can be pruned now, and vines can be pruned also in any district where there is no danger from late frosts, and where this can be done the prunings should be gathered and burnt, and the vineyard ploughed up and well worked to reduce the soil to a good state of tilth, so that should rain come it will absorb all that falls and the moisture can be kept in the soilby cultivation subsequently.

Citrus fruits will be at their best in the Western districts. The trees should be watered if they show signs of distress; otherwise all that is necessary is to keep the surface of the land well worked. All main-crop lemons should be cut by this time, as, if allowed to remain longer on the tree, they only become overgrown and are more suitable for the manufacture of peel, whereas if cut and cased now they will keep in good order so that they can be used during the hot weather.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF MARCH, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING MARCH, 1934, AND 1933, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Mar.	Average Rainfall. No. of Years' Records.	Total Rainfall. Mar., 1934.	Total Rainfall. Mar., 1933.
North Coast.	In.		In.	In.
Atherton	8 30	33	14 36	2 53
Cairns	17 87	52	19 11	12 48
Cardwell	15 62	62	8 87	2 87
Cooktown	15 03	58	9 81	8 81
Herberton	7 51	48	12 80	1 28
Ingham	15 50	42	8 49	4 96
Innisfail	25 87	53	32 38	10 05
Mossman Mill	17 32	20	27 16	12 23
Townsville	7 29	63	0 85	0 33
Central Coast.				
Ayr	6 49	47	0 22	0 13
Bowen	5 56	63	1 62	0 24
Charters Towers	3 74	52	0 59	0 02
Mackay	11 81	63	6 47	0 88
Proserpine	11 76	31	10 33	6 04
St. Lawrence	5 23	63	0 46	0 62
South Coast.				
Biggenden	3 77	35	0 95	0 28
Bundaberg	5 04	51	1 85	0 84
Brisbane	5 65	83	0 82	0 55
Caboolture	7 55	47	4 30	1 85
Childers	4 43	39	1 35	0 21
Crohamhurst	11 27	40	4 79	2 00
Esk	4·72	47	0 78	0 04
Gayndah	3 02	63	0 65	0
Gympie	6 11	64	2 38	0 33
Kilkivan	3 85	55	0 41	0
Maryborough	5 88	63	2 53	0 96
Nambour	9 10	38	3 97	2 75
Nanango	3 38	52	0 54	0 04
Rockhampton	4 41	63	0 23	0 11
Woodford	7 80	47	3 40	1 50

Divisions and Stations	Average Rainfall. Mar	Average Rainfall. No. of Years' Records.	Total Rainfall. Mar., 1934.	Total Rainfall. Mar., 1933.
Central Highlands.	In.		In.	In.
Clermont	3 05	63	0 03	0 10
Gindie	2 62	34		0 30
Springsure	2 91	65	0	0 42
Darling Downs				
Dalby	2 67	64	0 01	0 05
Emu Vale	2 34	38	0	0
Hermitage	2 18	27	0	0
Jimbour	2 52	46	0	0
Miles	2 65	49	0 05	0 86
Stanthorpe	2 62	61	1 03	0 85
Toowoomba	3 72	62	0 23	0 27
Warwick	2 48	69	0	0
Maranoa				
Roma	2 57	60	0 23	0 01
State Farms, &c.				
Bungeworgorai	1 55	19	0 40	0 75
Gatton College	3 17	34	0 32	0 08
Kairi	7 69	19		2 55
Mackay Sugar Experiment Station	10 84	36	5 30	0 96

GEORGE G. BOND, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—MARCH, 1934.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Shade Temperature. Means. Min.	Shade Temperature. Extremes. Max.	Date.	Extremes. Min.	Date.	Rainfall. Total.	Rainfall. Wet Days.
Coastal.	In.	Deg.		Deg		Deg		Points	
Cooktown	29 81	84	74	86	1, 3, 11, 14, 23 31	71	16, 26	981	23
Herberton	..	75	62	79	25, 26	56	20	1,280	22
Rockhampton	29·98	86	68	91	20	64	20	23	4
Brisbane	30·08	81	65	86	20	60	29	82	10
Darling Downs.									
Dalby	30·05	86	59	93	7	50	20	1	1
Stanthorpe	..	78	54	88	1, 24	45	6, 19	103	7
Toowoomba	..	78	59	86	24	49	19	23	2
Mid-interior.									
Georgetown	29·85	90	68	94	24, 25	60	21	24	3
Longreach	29·94	95	68	100	1	60	29	12	2
Mitchell	30 02	88	61	95	7, 22	52	21, 29	35	1
Western.									
Burketown	29 83	91	74	99	12	71	29	96	5
Boulia	29 87	96	73	100	2, 12, 19-22, 25	69	8, 29	Nil	..
Thargomindah	29 95	95	73	105	1	64	26	Nil.	..

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	May, 1934.		June, 1934.		MOONRISE. May, 1934.	MOONRISE. June, 1934.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	6·19	5·19	6·37	5·2	6·27	8·38
2	6·20	5·18	6·37	5·2	7·27	9·42
3	6·20	5·18	6·38	5·2	8·31	10·47
4	6·21	5·17	6 38	5·2	9·37	11·49
5	6·21	5·17	6·39	5·2	10·44	a.m.
6	6·22	5·16	6·39	5·2	11·48	12·51
7	6·22	5·16	6·39	5·2	a.m.	1·49
8	6·23	5·15	6·40	5·2	12·54	2·47
9	6·23	5·14	6·40	5·3	1·57	3·48
10	6·24	5 13	6·40	5·3	2·56	4·47
11	6·24	5·13	6·40	5·3	3·55	5·43
12	6·25	5·12	6·40	5·3	4·53	6·38
13	6·25	5·11	6·41	5·3	5 55	7·30
14	6·26	5·11	6·41	5·3	6·55	8·18
15	6·26	5·10	6·41	5·3	7·51	9·1
16	6·27	5·9	6·41	5·3	8·45	9·37
17	6·28	5·9	6·42	5·4	9·36	10·10
18	6·28	5·8	6·42	5·4	10·23	10·39
19	6·29	5·8	6·42	5·4	11·3	11 8
20	6·29	5·8	6·42	5·4	11·37	11·37
					p.m.	p.m.
21	6·30	5·7	6·43	5·4	12·6	12·8
22	6·30	5·7	6·43	5·4	12·39	12·40
23	6·31	5·7	6·43	5·4	1·7	1·16
24	6·32	5·6	6·44	5·4	1·37	1·58
25	6·32	5·6	6·44	5·5	2·10	2·51
26	6·33	5·5	6·44	5·5	2·44	3·54
27	6 34	5·5	6·44	5·5	3·24	5·2
28	6·34	5·4	6·44	5·5	4·12	6·12
29	6·35	5·4	6.44	5.6	5·10	7·24
30	6 35	5·3	6·44	5·6	6·14	8·34
31	6 36	5·2	..	..	7·23	..

Phases of the Moon, Occultations, &c.

6 May.	☽ Last Quarter	4 41 p.m.
13 ,,	● New Moon	10 30 p.m.
22 ,,	☾ First Quarter	1 20 a.m.
29 ,,	○ Full Moon	7 41 a.m.

Apogee, 19th May, at 5.54 a.m.
Perigee, 31st May, at 5.12 a.m.

The Moon will occult Antares, the principal star of Scorpio, about an hour after midnight of the 1st of May.

The nearest approach of Mercury to Mars, to within about half a degree on the 8th, will be prevented from being a popular spectacle by the closeness of the Sun, which passed Mars from west to east on the 14th of April.

The nearness of the Moon to Venus at 10 a.m. on the 10th will be interesting to notice, with or without binoculars, although in broad daylight. They will be high up towards the N.N.W., only 4½ degrees east of the 24th meridian, which may be said to run along the eastern side of the Great Square of Pegasus. The distance of Venus from the Moon on its southern or upper edge will be 6 degrees, the length of the Southern Cross.

On the 13th Mercury will be in superior conjunction with the Sun, and so remarkably in a line with it as to be only one minute of arc from the Sun's centre when directly behind it.

On the same day the Moon will be new at 10.13 p.m. It will reach Mars at midday and Mercury 14 hours later, but all three will be entirely lost in the glare of the Sun.

Neptune, having reached Right Ascension 10.46 on the 21st, will become stationary for about seven days, after which it will resume its eastern motion till the end of the year. From our point of view Neptune reached Leo on 24th July, 1922, and has remained with that constellation as its background up to the present time. About another years seems to be required before Neptune will reach Virgo.

The Moon will give a good indication of Neptune, which will be 4 degrees north of it, on the 22nd at 11 p.m., when both will be getting down to the western horizon.

The conjunction of Jupiter and the Moon will take place at 5 p.m. on the 25th, when Jupiter will be 7 degrees to the northward. An hour later both may be distinctly visible in the north-east, but the distance between them will then be 7½ degrees.

Antares will be again occulted on the 29th before midday, when the star and Moon will be 4½ hours below the western horizon.

4 June	☽ Last Quarter	10 53 p.m.
12 ,,	● New Moon	12 11 p.m.
20 ,,	☾ First Quarter	4 37 p.m.
27 ,,	○ Full Moon	3 8 p.m.

Apogee, 15th June, at 8.18 p.m.
Perigee, 28th June, at 10.54 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

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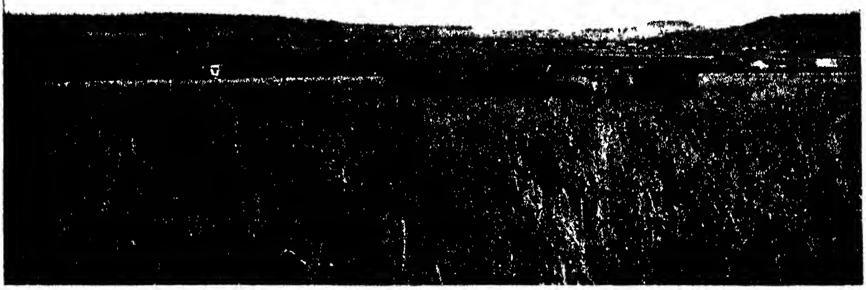
QUEENSLAND AGRICULTURAL JOURNAL



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Event and Comment.

Carcass Competition—Export Meat Classes.

TO show producers their cattle, lambs, and pigs as dressed carcasses for export, a competition was conducted in the course of the month at the Brisbane Abattoir. It was the first competition of its kind in Australia. The idea at the back of it was to show the best type of cattle, lamb, and pig for the export trade. The competition attracted wide interest, and entries came from all parts of Queensland. There were 38 lots in the cattle section, comprising 380 beasts. They were of excellent quality, although some were over weight. The present demand is for smaller and quicker maturing animals. Although it is not the right season for lambs, the exhibits generally were excellent. The same tendency towards over weight was noticeable in the pig section. Nevertheless, the entries provided definite evidence why Queensland's export of pork has increased from almost zero three years ago to an important industry; and also why carcasses from the Brisbane Abattoir compete successfully with the products of other countries. The pigs included whites, middle whites, large whites, British blacks, Tamworths and Berkshires, and crosses of these breeds.

In opening the exposition on judging day, the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, said that it was interesting to recall that Queensland had more surplus meat for export than any other country in the British Empire. Despite all the talk of international agreements, quotas and restrictions, Queensland's meat industry was worth developing to an ever greater extent. The Meat Industry Board had had vision and had introduced a practice which would be of material benefit to Australia. From the experimental point of view, said the Minister, the lamb competition was the more important, and judging by the carcasses entered they had nothing to fear so far as the lamb industry is concerned. It had been stated recently that pork was the best exportable prospect for Queensland, and if they were able to build that trade up so much the better. The Meat Board was doing everything possible to foster the pork export trade. If producers did not utilise their by-products it would mean stagnation in the industry. The pig raising and exporting industry could be of great advantage to the dairy farmer in this respect. "We have a right to a share of the world markets, and the time is not far distant when that right will not be questioned as at the present time," remarked the Minister in concluding an able address on the Queensland Meat Industry.

Pure Milk Supply.

"THE idea seems essentially sound and the Council of the British Medical Association takes this opportunity of congratulating the Government upon a practical attempt to solve a difficult problem." This comment is contained in a statement issued by the Council of the British Medical Association in respect of the regulations recently gazetted on the subject of certified milk supplies.

For many years most medical men have felt that they could not safely advise the use of unboiled milk for infants and young children, notwithstanding the many advantages of raw milk. Previously, there was a feeling that the proposed legislation to improve the quality of the milk would have tended to the raising of its price, so that it could not have been available to poorer children in sufficient quantities. The present Ministry has devised a practical solution which should allow consumers to obtain a purer supply of milk at little or no increase in cost, and, at the same time, give dairymen who are prepared to supply it an advantage commensurate with their increased outlay. The Council of the British Medical Association has given careful consideration to the regulations, and has noted with satisfaction the two high qualities of milk which have been prescribed. But until this high standard is attained in the production of a pure raw milk, pasteurisation must be looked upon as our chief safeguard in establishing a pure and safe milk supply.

"Certified milk" which has to be cooled, bottled, and sealed immediately after milking and delivered in that condition to the consumer, would, no doubt, command a higher price than that ruling to-day, on account of the expense entailed in installing the necessary plant, but the consumer would be sure of obtaining a safe and pure milk especially suitable for consumption by infants in a raw state. Milk from a certified dairy, for which a similar bacteriological and chemical standard had been prescribed, should, however, be sold at the same general price as that operating at present. This quality of milk does not require to be bottled, but the consumer would know that the milk comes from a healthy

herd and from a hygienic dairy. This milk should be safe for consumption in a raw state by children and adults, and would be a great advance upon anything that has previously been obtainable.

The Medical Council is of the opinion that the dairyman who voluntarily produced "certified milk" or "milk from a certified dairy," should reap some reward for his enterprise and for the high quality of his milk, and is pleased to note that the householder may distinguish such dairymen by the designs on the milk vehicles: the vehicles painted white with a blue star for "certified milk" and with a blue band for "milk from a certified dairy." No other dairymen are permitted to use on their vehicles anything which resembles these designs. The scheme, although entirely voluntary, is calculated to overcome the two main difficulties to be encountered in improving the city's milk supply—the elimination of cattle affected by disease which might be conveyed to humans per medium of the milk, and the observance of scrupulous cleanliness in the dairy and in delivery to protect the milk from infection before it reaches the consumer.

The provision that all herds must be tested and remain under test, and all animals affected by disease destroyed, would possibly entail loss to the dairyman; but, on the other hand, no milk supply could be considered satisfactory until this has been done. Also, in either case, the standard of hygiene required in the dairy and among its employees must be considered as higher than that reached by most dairies at the present time.

Briefly the regulations provide, in the case of "certified milk," that such milk should be produced on premises especially approved for the purpose by the Department of Agriculture and Stock, and from a herd every animal of which has been certified free from disease. Such milk requires to be cooled to 45 deg. F. and bottled immediately on the premises. The bottles require the name of the producer and the date of production and the words "Certified Milk" on the closing disc. The bacteriological standard is a maximum of 30,000 micro-organisms to the cubic centimetre during the summer period, and 20,000 per c.c. during the winter months. In chemical composition, it requires to conform with the ordinary standard for milk. The regulations further provide for the effective sterilisation of bottles and equipment, the institution of hygienic measures in milking operations, such as the effective cleansing of the hands and the udders and teats of cows; while provision is also made to ensure the freedom from disease of employees. A stringent clause has been inserted to prevent misrepresentation, either by verbal statement or advertising matter, thus protecting both the consumer and the legitimately certified milk vendor.

In the case of "milk from a certified dairy," similar provisions are made, except that such milk does not require bottling, but might be delivered in cans under the system at present prevailing. This quality of milk, however, requires to be retailed direct by the producer.

The Medical Council is of the opinion that the improvement of the city's milk supply is now in the hands of the consuming public. Upon their insistence to be supplied with "certified milk" or "milk from a certified dairy" depended the success or failure of the scheme. It feels sure, however, that the public generally will appreciate the efforts of dairymen who are prepared to meet the additional expense and trouble in producing a safe high-quality milk.

Queensland Citrus Scale Insects and their Control.

By W. A. T. SUMMERVILLE, M.Sc., Assistant Entomologist.

(Continued from page 486.)

PINK WAX.

PINK Wax was originally described by Maskell in 1892 under the name *Ceroplastes rubens*. In a paper published in 1900 Green included the insect in the species *C. myricæ* Green, an error which he afterwards corrected, and all important references to the insect in Australian literature will be found under the correct name *Ceroplastes rubens*.

Description.

The active reddish coloured larvæ are rather more often observed than most other species, as they are somewhat more conspicuous on the green leaves than are most other species on the parts on which they are to be found. On settling down, the young quickly secrete a white covering. As development proceeds a band of red or pink wax appears below the margin of this white cap, and this band gradually increases in size. Soon the appearance is as follows:—The white cap has increased, particularly in height; below this all round is a red margin, about as wide as the cap is high, broken by eight white prominences, three on each side and one at each end, forming a series of rays. The scale of the adult female (Plate 140) is almost globular in shape and smooth, except at the top where a slight depression occurs, and towards the margins where there are two lobes on each side, the anterior one of which is well defined and prominent. Towards the base the wax may be produced to form a well-defined flange. The colour is deep pink, except at the apex where the white dot persists, though it may lose much of its whiteness, and at the sides where narrow bands of white mark the positions of the stigmata. These white lines vary in length, and extend well on to the smooth area. In crowded colonies the outline may be confined to the length of the lobes down which they run or may be considerably modified by pressure of one scale against the next.

The adult female is very soft bodied, and in the field it is difficult to remove all the wax without injuring the insect. Denuded, it is found to be hemispherical in shape, with a cavity beneath into which the eggs are deposited. The colour varies from pink to reddish brown, and the legs are very small. The length of the female scale is from one-eighth to one-sixth of an inch. The adult male has not been observed in Queensland.

Distribution and Habits.

Pink wax was probably introduced into Australia from Ceylon or some neighbouring country. It has been recorded from Ceylon, Japan, the Hawaiian Islands, and elsewhere. The species is very common in the coastal parts of Queensland, and extends well into the interior also. The list of host plants is very long, and it may be said that it is never surprising to find pink wax on any plant, other than those typical of dry climates (*Xerophytes*). It is particularly prevalent on trees growing along watercourses near the coast, and river cherry trees *Eugenia* spp.,

PLATE 140.
Pink Wax Scale, *Ceroplastes rubens* Maskell, showing infestation of leaves and twigs.

almost always carry enormous populations. Such trees, which have a deep green foliage, commonly appear almost totally black in consequence of the growth of sooty mould which accompanies the pink wax on the leaves. Indigenous trees, particularly river cherry, form a constant and prolific source of infestation from which the scale spreads to orchard trees. A number of other cultivated plants are attacked, but the insect is usually of importance only as a citrus pest, though mango, custard apple, and ferns are at times severely infested. Figs (cultivated and indigenous), guava, banana, pomegranate, pepperina, eucalypts, and Brassaia (Umbrella tree) are a few of the commonest host plants.

The eggs are encased beneath the scale in a concavity in the body of the female. On emerging, the young crawl around for a considerably longer time than do most species found on citrus. Observations on this point showed that the great majority of young do not settle down until at least three days after they emerge from beneath the mother. The period in which the distribution of the young may take place is correspondingly long and mechanical scattering is thus very effective. The most important means of dispersal is the wind, and trees, or portions of trees, exposed to the wind may be quickly infested from indigenous hosts considerable distances away. Thus it is usual for the tops of tall trees to become infested in the first place, and if the number of crawlers arriving in the orchard in this way is not very large the colonies may be confined to the few topmost branches. It is therefore the tops of trees which should be kept under observation in orchards which are free of the pest but which are liable to infestation. The pest may remain confined to the top branches for a considerable time, but usually the infestation spreads all over the tree when the following brood appears.

When settling down to feed the insects always select a position in which there is a plentiful supply of sap and where the tissue is very soft. Thus colonies are found only on leaves and tender twigs. On leaves the insects are usually confined to the midrib, or at least to one of the main veins (Plate 141). Both surfaces provide feeding areas, and citrus leaves are commonly found on which practically the whole of the midrib on both surfaces is hidden from view beneath the scales. Such leaves may carry over a hundred individual insects, and seventy on one side is not very uncommon.

As it is the most tender, freegrowing twigs which carry the colonies it is most frequently the wood which is bearing fruit, or which is to bear the following crop, that is affected. Though pink wax is not a particularly voracious feeder the numbers which are habitually present, together with the nature of the parts principally attacked, result in considerable injury. Leaves may be killed, but twigs succumb only in exceptional cases, and the most important direct result is the reduction in the size of the fruit. This reduction in size is often overlooked, but it has been shown to be very considerable. By reducing the vigour of affected twigs pink wax commonly paves the way for infestation by the more serious mussel scale. This forms part of a well-defined succession. A healthy tree becomes infested with pink wax, and the vigour is so impaired that mussel scale gains a hold. This leads to the destruction of small twigs and the weakening of larger ones. This in turn favours the entrance of melanose. Unchecked, the mussel and melanose together accomplish the death of larger twigs and branches,

and finally quite large limbs may succumb. The succession described is responsible for much of the dead wood which appears in otherwise healthy trees.

A further great objection to pink wax is that it always has associated with it a copious growth of sooty mould, and with no other scale occurring on citrus in the State is there nearly the same amount of this fungus. Heavily infested trees may present a uniform black appearance. Both surfaces may be covered completely by layers of fungus, and not only are the leaves so affected, but a proportion of the fruit may also be partially covered. Such trees may have more than 70 per cent. of the foliage effectively screened from the sunlight and practically every fruit somewhat blackened. The cutting off of the sunlight from the leaves is an important indirect effect of a heavy infestation by pink wax, for leaves so affected may be practically useless to the plant. It is, however, the fungus on the fruit that gives growers the greatest concern as a rule. The fruit must be cleansed before it can be marketed successfully, and though most of the black can be removed fairly easily by

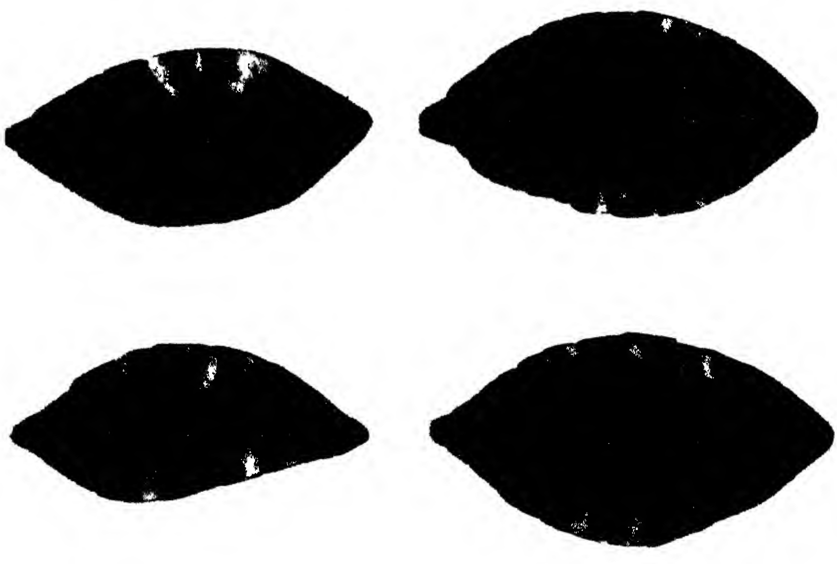

PLATE 141.
Pink Wax Scale, *Ceroplastes rubens* Maskell, showing young in correct stage for spraying.

brushing, the last traces often have to be washed off, particularly if the rind be at all rough. The Emperor of Canton mandarin, which is the variety most frequently calling for attention in this respect, is a soft fruit with a rind that is by no means smooth. As a general rule any attempt to remove the last residue of the fungus by extra use of a hard brush is likely to result in injury to the fruit. The pink wax and its associated growth of sooty mould are usually more in evidence in wetter seasons, and it is at such times as these that the common blue and green moulds cause most loss. A good deal of the loss through these rots is attributable to the handling the fruit receives before it leaves the

packing shed, and the removal of sooty mould by the use of dry brushes is particularly liable to cause injury to the rind at such times, thus facilitating the entry of the rot fungi. Washing in water containing borax is preferable at all times to brushing when large numbers of fruit have to be so treated, and in such circumstances as those discussed above dry brushing should never be employed.

Whilst all commercial varieties of citrus are susceptible to attack by pink wax, preference in this respect is very noticeable. In Queensland the pink wax is primarily a pest of the Emperor of Canton mandarin. It is grown extensively, and it is very rarely indeed that a tree of this variety does not harbour appreciable numbers of pink wax scales. Other mandarins are also favoured, particularly the Scarlet variety. Oranges, as a rule, are not greatly troubled by the pest, but Washington Navels, when young and very vigorous, frequently carry large populations. Seedling trees of the round orange type are also rather heavily infested at times. Lemons, on the other hand, are very seldom attacked, and it is uncommon to find even a few individuals on this species of citrus. The varietal preference is apparently dictated by the same urge which causes the insect to seek the favoured parts of trees. Thus even an Emperor of Canton tree which, on account of loss of vigour, is not carrying the usual supple tender fruit-bearing wood may be quite or almost free of the pest, and with all varieties the degree of infestation is dependent on the vigour of the tree. When favoured varieties growing in a position where infestation is probable do not become infested, it can be suspected at once that the health of the tree needs attention.

The incidence of pink wax is so closely bound up with the condition of the tree that even with indigenous plants it is sometimes found that a particular species will carry the scale only when there has been abundant new growth available when young scales were moving.

As high temperatures in coastal districts are usually associated with humid conditions and closely followed by rain, it is in such times that trees make their best growth, and thus pink wax increases noticeably at such times. In the interior parts, however, long periods of hot weather may occur without any appreciable fall of rain, and in these parts hot weather is commonly followed by a decrease in the populations of the insect. Long periods of low temperatures, on the other hand, appear to adversely affect the insect, and though mortality of insects in the winter is not at all marked, the early summer brood is usually much smaller than that in the late summer. Crawlers are not found in the coldest times, and therefore the effect of cold on the youngest stage has not been observed and is of no moment in Queensland. It will be seen by comparison that in many important characteristics pink wax may be directly contrasted with the red scale, and thus it is very unusual to find these two species on the same tree concurrently. Both species, however, may be found on the same tree in large numbers at times when a good spring has been followed by a long, dry summer. In such cases the pink wax is usually obviously distressed, and before control has to be established one or other of the species will usually not have to be considered. In years when the monsoonal rains are long delayed or very light, however, the control of both red and pink wax scales on the same tree may be required.

Life History.

Under normal conditions in the orchard there are two well-defined generations of pink wax each year. The times of commencement depend, of course, on a number of conditions and may vary a little. Generally the first brood following the winter may be expected to appear during November, but at times the main hatchings may be delayed until early December. December, January, and part of February, are passed in immature stages. Eggs are then again produced towards the end of February, or more typically early in March. No further broods occur until the following November. Each female may produce progeny over a period of about one month. When the weather remains very dry at about the normal time of reproduction, the appearance of the following generation may be delayed and hatchings then be spread over a longer period. That is to say, young are to be found over a longer period than usual, but this is due rather to variation in time of egg-laying by different individuals than to any very great prolongation of the period of fecundity of each female. Thus, when normal monsoonal rains are delayed the first female to reproduce may do so almost two months before the slower ones commence. This, fortunately, is not a common occurrence, for it is much more difficult to establish control under these circumstances than when young of approximately the same age are being combated.

On ferns and other such plants grown under artificial conditions the breeding of pink wax is sometimes affected, and irregular partial broods may be found. Growers are sometimes misled by the occurrence of such generations induced by the artificial conditions, and for the purpose of citrus growers only those trees outside the orchard which serve as sources of infestation need be considered. On these it will be found that there are the same number of broods as on citrus, but these broods may commence at slightly different times from those in the orchard. The variation, however, is slight and never of much consequence, except perhaps where irrigation is practised.

WHITE WAX.

White wax, *Ceroplastes destructor,* was described by Newstead in 1917. For many years the Queensland white wax scale was thought to be *Ceroplastes ceriferus* Anderson, and it is under this name that most of what has been published on the insect has appeared. During the course of investigations in New South Wales recently, however, Zeck[8] found that all the specimens he had from citrus were *Ceroplastes destructor* and not *C. ceriferus.* The evidence gained during the investigations now being recorded, supports this conclusion, and though *C. ceriferus* occurs on a number of indigenous plants in Australia apparently it does not attack cultivated citrus.

Description.

The vernacular name aptly describes the appearance of the species (Plate 142). The young, on settling, are quickly covered by a waxy coating the margins of which are produced outwards in a series of arms or rays. The form soon changes, and the general shape is conical though the base may not be evenly rounded. As development proceeds the conical shape is lost and the scale becomes more or less globular in form, somewhat flattened on top, and with irregular protuberances on the sides. Colonies are typically so crowded that the outline of the individual

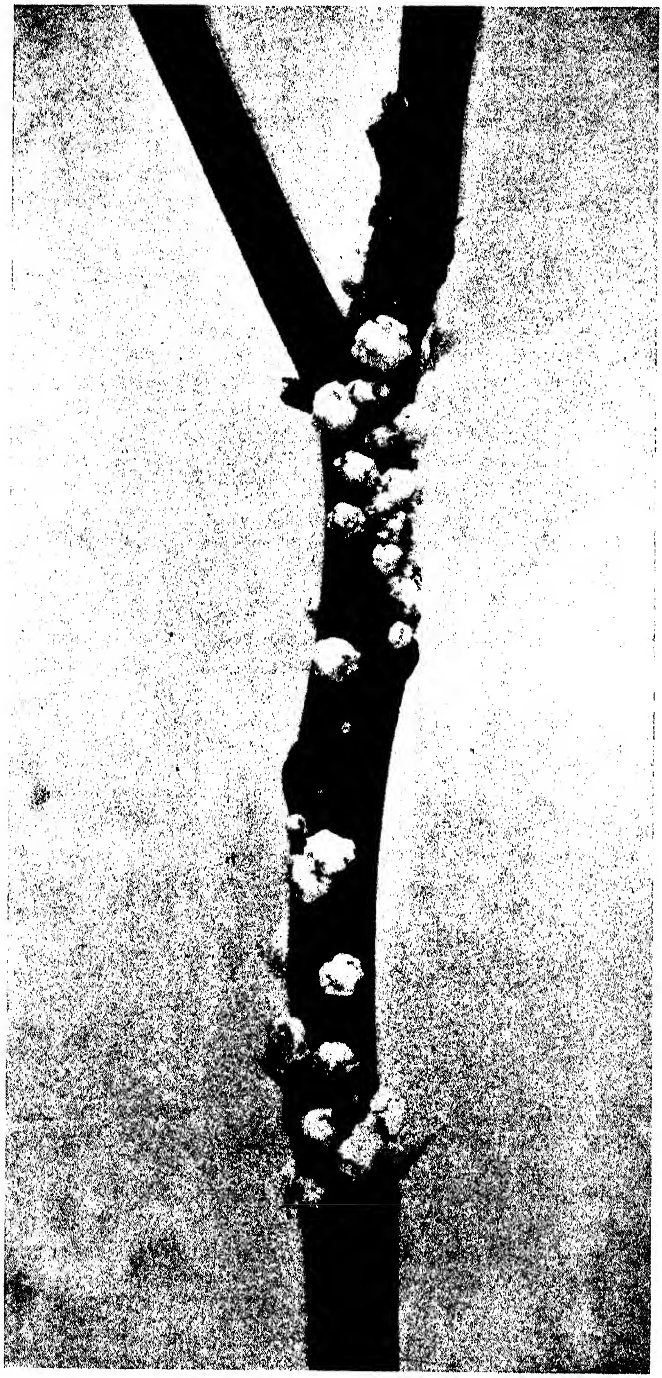

PLATE 142.

White Wax Scale, *Ceroplastes destructor* Newstead, showing infestation on small branch.

scales may be variously modified and the whole appear like a series of irregular masses of wax along the twig. The colour is at first white and rather shining, with a snow white line of flatter white marking the position of the stigmata. Later the general colour becomes duller, and old specimens may be almost grey. The male has not been observed in Queensland. The length of the scale of the female is three-eighths of an inch.

Distribution and Habits.

White wax scale was described from Uganda where it infests coffee, cocoa, Croton, and other plants. Zeck records it from more than twenty species of trees in New South Wales, and there is little doubt that most of those plants or allied species would be included in a complete list of hosts in Queensland. Little work has been done on this question in Queensland, and the only plants other than citrus from which the species can at present be definitely recorded are river cherry (*Eugenia* spp.), *Helichrysum diosmopholium*, Gardenia, persimon, and guava. The insects spread from these hosts to orchard trees, but it is seldom that white wax becomes a pest of commercial citrus in this State. It is more commonly found in orchards in coastal parts than in the interior. Even on the coast, however, it is usual to find only one or two trees in an orchard which carry more than a few individuals. Occasionally more general infestations do occur, both on the coast and further inland, and control measures have to be adopted, but the pest is nowhere as important in Queensland as it often becomes in New South Wales. Though the scale cannot be considered to be of more than minor importance in Queensland at the present time, there is some reason for thinking that its importance may be increasing. Certainly during the past twelve months more inquiries have been received concerning white wax than during any of the previous five years. This may be due to the influence of quite temporary factors causing an increase in populations, both in orchards and on uncultivated host plants, and it will possibly be found that the larger populations in orchards will not be maintained for any considerable period. Close observation of the position should be kept, however.

Life History.

Unfortunately, owing to the destruction of experimental trees by an outside agency the breeding work lacks the continuity necessary to enable a definite statement to be made. It appears, however, that there is but one generation each year. In 1932 large numbers of crawling young were found early in November. Young continued to emerge in large numbers throughout December. Those young which had emerged in November were used in the breeding work. By the following June a number of these were almost full grown in size, but the great majority were scarcely half that size. It was soon after this that the tree was destroyed. During July the greatest number of individuals observed in the orchards were approximately half grown, but late in that month (1933) a few females in one colony were found to be reproducing. Young were secured from these, but none survived to become established. No other young were found until the following November. Further young were observed in December and January.

It would appear then that normally there is but one generation each year commencing in November and December, or less typically early in

January. The occurrence of young in July was probably abnormal, and it would seem that mortality of crawlers at this time of the year is very high.

THE LONG TAILED MEALY BUG.

The long tailed mealy bug (*Pseudococcus longispinus* Targ.) was described by Targioni-Tozetti in 1867 under the name of *Dactylopius longispinus.* In much of the Australian literature the insect is referred to as *Dactylopius adonidum,* a name given it by Signoret in 1875. There are a number of other synonyms, but these are of little importance. The generic name *Dactylopius* is, however, now not applicable, and *Pseudococcus* is the correct name. In some recent literature this species is again referred to as *P. adonidum* the authority given being Linnaeus.

Description.

This mealy bug, like other members of its group of Coccidæ, does not remain stationary but wanders about the plant for the greatest part of its life. The insect is well described by the vernacular name. It is active, elongate oval in outline, and covered by a white mealy secretion. At the margins a series of filaments project well out from the sides of the body. At the posterior end are four filaments, two of which are noticeably longer than the body. It is unlikely that orchardists will confuse this insect with any other scale on citrus, but confusion occurs between this and the larvæ of the ladybird, *Cryptolæmus montrouzieri* Muls. The similarity, however, is not very marked. The ladybird larva is a flatter white in colour, and the projections from the sides of the body are much coarser in structure. The legs are stout and the jaws are prominent, whereas with the mealy bug the legs are slender and the mouth parts of the delicate sucking type. When observed together, as they commonly are, if the mealy bug be seen at all, the differences in general appearance are obvious, and only very young ladybird larvæ would be mistaken for the coccid. The length is one-sixth of an inch.

Distribution and Habits.

The long tailed mealy bug is widely distributed in tropical and semi-tropical countries, where it attacks a large number of plants. It also occurs in temperate countries, but in these regions it is usually a pest in hot houses.

The insect cannot be considered a pest of citrus in Queensland. Though it has been found in the Burrum, Gayndah, and Maroochy districts, it is seldom seen and never occurs in large numbers in orchards in this State. No injury attributable to this insect has been noticed in any orchard, and the insects are usually observed endeavouring to escape from the ladybird *C. montrouzieri,* or climbing the trunk of the tree when returning to the twigs after being removed by jarring.

Life History.

No work has been done in connection with the life history of this insect in Queensland.

COTTONY CUSHION SCALE.

The name *Icerva purchasi* was given to the cottony cushion scale by Maskell in 1878. Unlike many other species, there has been little or no confusion as to its true identity, and all references to the insect will be found under this name.

Description.

The scale is very distinctive in appearance, and there could scarcely be any confusion with any other species found on citrus. The rather flat young are dark-red in colour, and the body is covered with a yellowish or dirty creamy-coloured cottony secretion. Long delicate hairs are carried on the antennæ and at the anal end of the body. Soon after feeding has commenced four areas of callous-like formation are prominent on the dorsal surface, and similar smaller areas may be seen towards the margins. A long single hair projects from the anal end, and at the tip of this a droplet of clear liquid can generally be seen. The dark hairy antennæ and long legs are conspicuous. As they develop the females become somewhat convex, and the body, which is dark-red or reddish-brown in colour, is covered with a yellowish mealy matter. The body is adorned with a mass of minute hairs which imparts a rather woolly appearance to it. Long delicate filaments project from the margins. When about to produce eggs the adult female secretes an ovisac. This ovisac is composed of snow-white cottony material compressed together, and the exterior is distinctly and regularly corrugated. Ultimately the insect rests on the anterior end of this ovisac in an almost perpendicular position with the posterior end uppermost. The length of the female is one-quarter of an inch. The adult male is of the usual delicate form, but is rather larger than the males of most other citrus scale insects. It is orange in colour, and the wings are smoky.

Distribution and Habits.

Cottony cushion scale is thought to be native to Australia, but it is now distributed throughout the world. It has been recorded as having been particularly destructive in California, South Africa, and New Zealand. The insect attacks many plants, including wattle, rose, grape, figs, and several species of deciduous fruit trees. It is primarily as a pest of citrus that the insect has become widely known. It cannot be considered of any moment as a pest of citrus in Queensland, however, and is not a very common insect on any cultivated plant. It is more frequently brought to notice as damaging roses than for any other reason. Very few orchards in the State harbour the species, and infestations are usually small and generally confined to a few trees only. For the most part the scale feeds on the twigs, and the injury which a few individuals can cause in a short period makes it easily realised why the cottony cushion scale is so feared in other places. Unlike most of the scale insects on citrus, cottony cushion does not become fixed early in life, and the females are found moving about the plant until the time of reproduction.

That the insect is of so little significance in this country is due to a very great extent to the wonderful degree of control exercised by its natural enemies. If for any reason these natural enemies are temporarily absent from a locality the insect quickly asserts itself. Fortunately, however, such absences are very rare, and as both the coccid and its most effective natural enemies are native to the country, or at least have been here for a very long period, there is no reason for anticipating that the present status of the insect will change, and cottony cushion scale will almost certainly remain of very minor importance as a citrus insect in this State.

Life History.

The life history as recorded in what follows was compiled from data obtained from rather a small number of insects. It is very difficult to breed the insect under natural conditions, as the abundance of predators and parasites continually reduces the number from which significant data can be obtained. However, observations in the field support the evidence obtained in experimental work.

The winter is passed in immature stages. Ovisac formation may be commenced as early as the beginning of August, but large numbers of young are usually not observed until late in that month, or even early in September. The females of this brood reach maturity and reproduce again in November or December, most typically rather late in December. The second generation then making its appearance develops during the following three months. At this time of the year ovisac formation may begin about sixty days after emergence. During March a third brood is produced, the individuals of this being the parents of those young found in the following September. The time of appearance of the late summer brood appears to vary somewhat, and young may be found in February, March, or even early April.

SOOTY MOULD.

Sooty mould, fumigine, or black smut, as it is variously called, is so well known and so well described by the vernacular names that no further description is necessary. The tangled mass of hyphæ of the fungus, *Capnodium citri* Berk. and Desm., which produces this familiar black coating on leaves, twigs, and fruit is associated with several species of Queensland citrus scale insects. The fungus grows on a fluid secreted by the insects. This fluid, which is commonly termed honey dew, varies in nature and amount with different species, and thus, though commonly secreted by scale insects, it is only that of certain species which supports sooty mould. The fungus has no organic connection with the plant, but grows on the honey dew and is wholly supported by that fluid. This is fairly generally known by orchardists, and too often it is inferred from this that the tree suffers nothing on account of the presence of the fungus on the leaves and twigs. Leaves are able to function correctly only when they are exposed, and thus a leaf covered by sooty mould may become almost or quite useless to the plant When the number of leaves so affected is large the reduction in effective leaf surface cannot be ignored.

The greatest objection which orchardists have to the fungus is that it often spreads over the surface of the fruit and thus makes it necessary to clean the fruit before marketing. This involves both extra time and labour, even when the amount of fungus on each fruit is small and can easily be removed by brushing. When the fruit are badly affected, however, the most severe brushing to which the fruit can be subjected without risk of injuring the rind is at most only partially effective. Injury to the rind is frequently followed by infection of the fruit by blue or green mould, and the fruit may thus be lost. A light brushing only should be used, and where this is not sufficiently effective, washing in warm water containing borax or similar disinfectant should be undertaken. A common method employed for the removal of sooty mould is to place the fruit in a barrel partially filled with sawdust and then rotate the barrel. The friction of the fruit against the sawdust acts as a brush. This method is effective, but has many objectionable features.

and care should be exercised when it is used. The commonest fault is to have too many fruit and too little sawdust in the barrel, thus allowing considerable jarring of the fruit. In any case, there is considerable jarring, and only the very firm fruit which is to be sold within a day or two of being cleaned should be treated in this way. The method has very little to commend it except that it is cheap.

The removal of sooty mould by spraying is sometimes undertaken, but it is only on very rare occasions that this should be contemplated. If for some reason it has been impracticable to establish control of the scale pest, it may be possible to obtain good results by spraying for the removal of the smut a little before the crop is to be harvested. This, however, should be used as an emergency only, and it must always be borne in mind that the scale is the pest and the sooty mould merely one of its ill-effects. The cause must be combated in all possible cases.

ANTS IN RELATION TO SCALE INSECTS.

As a general rule, ants will be found associated with colonies of scale insects. In most instances on citrus trees it is the small brown ant, *Pheidole* sp., which is found running about the scales. These ants are sometimes thought to attack the pests, but this is not so, and for the most part the ants are searching for honey dew. In some cases the ants incite the scales to secrete this fluid for their benefit. By removing the honey dew the ants do some good, for they thereby lessen the amount available to support sooty mould. This good, however, is often offset by the harm done in interfering with the work of natural enemies, many of which are minute wasps which would be disturbed in ovipositing or searching for suitable sites for oviposition. In some instances the ants are known to assist the scale insects by distributing them and actively protecting them. On the whole, ants in association with scale insects on citrus are either of little value or actually harmful.

NATURAL ENEMIES.

Queensland must be considered fortunate in respect to the natural enemies of the scale insects of citrus. The great majority of the parasites of citrus scales of proven outstanding value which would be expected to become acclimatised in Queensland orchards are well distributed throughout the State. Many of these natural enemies are indigenous to Australia, and for the most part the remainder have been imported without contemplated assistance and thus without expense. When the large sums of money expended by other countries in the importation of some of these useful insects is considered, the good fortune of this State is easily realised. Whilst it is possible that a number of other species of these enemies not yet found in Queensland would accomplish some good, on the whole there is little justification for expending any money on importing and establishing any of the known useful parasites of any Queensland citrus scales, with possibly one exception. It would appear that in the case of pink wax extended biological control by the introduction of parasites from other countries might be expected to meet with success.

Whilst little active assistance can be given the natural enemies of scale insects by the orchardist, it it within his power to make better use of these friendly insects than is frequently the case. In the first place, there is much needless destruction of these species, both by design and

incidentally. Upon thorough examination, colonies of scale insects are frequently found in which so many individuals are parasitised that any artificial control work would not only be wasted but would lead to the destruction of thousands of the useful species. For this and other reasons connected with control, it is advisable that orchardists acquire some knowledge of the most useful of the natural enemies of their scale pests.

The important natural enemies are of two kinds—namely, insects and fungi. Of the two, the insects are by far the more important in this State, and belong to the following groups:—Moths, ladybirds, lace wing flies, and chalcid wasps.

Moths.

There are a number of moths whose larvæ prey on the scale insects, but the only one which is at all common in most parts is *Catoblemma dubia* Butl. The adult of this moth (Plate 143, fig. 3) measures approximately three-quarters of an inch across the outspread wings. The forewings are brown, with the margin lighter and appearing rather bluish at times. The creamy white larvæ (Plate 143, fig. 1) work beneath a covering web in which are entangled the scales of insects devoured, and other débris. These scales may be so placed on the web that a cursory glance would not reveal any difference between the area where the larva is at work and any other part of the colony. The small brown pupa is enclosed in a cocoon of creamy webbing (Plate 143, fig. 2). *Catoblemma dubia* is a most important enemy of white louse (Plate 145) and circular black scales, and it is also commonly associated with pink wax. The moths appear to be more abundant in dry years than at other times, and in these dry periods remarkable results are sometimes achieved against the two first-mentioned pests. Normally, the grubs are most numerous towards the close of the summer, and thus it is advisable to examine colonies of the circular black scale before fumigating or spraying. As white louse spraying should not be undertaken until late in the winter, the full effects of the moth against this scale are usually apparent some time before artificial control is contemplated.

The remaining moths are similar in general respects to *C. dubia*, but are all of lesser importance. Of these a second species of *Catoblemma* at times effects very material control against species of soft scale in the more inland parts of the State. This is a new species which Dr. A. J. Turner proposes to describe as *C. trigonographa*. The pupæ of this species are enclosed in large, tough cocoons which are commonly found matted together in groups, and generally against the base of the tree at ground level.

Ladybirds.

The adult ladybirds are well known, and their worth commonly recognised. Unfortunately, the occurrence of a few destructive species misleads some growers to suspect other species. There is, however, no ladybird which attacks citrus in Queensland, and all species found on that plant should be protected. For the purpose of rough identification it may be said that all small members of the family and all those which are large and shining are useful. Confusion is sometimes caused by the occurrence on citrus of the beetle, *Monolepta rosæ* Blkb., a most destructive insect to many plants, including citrus. The elongate shape of this insect, however, readily separates it from the more rounded, or at least well-proportioned, ladybirds. Though the adult ladybirds are well

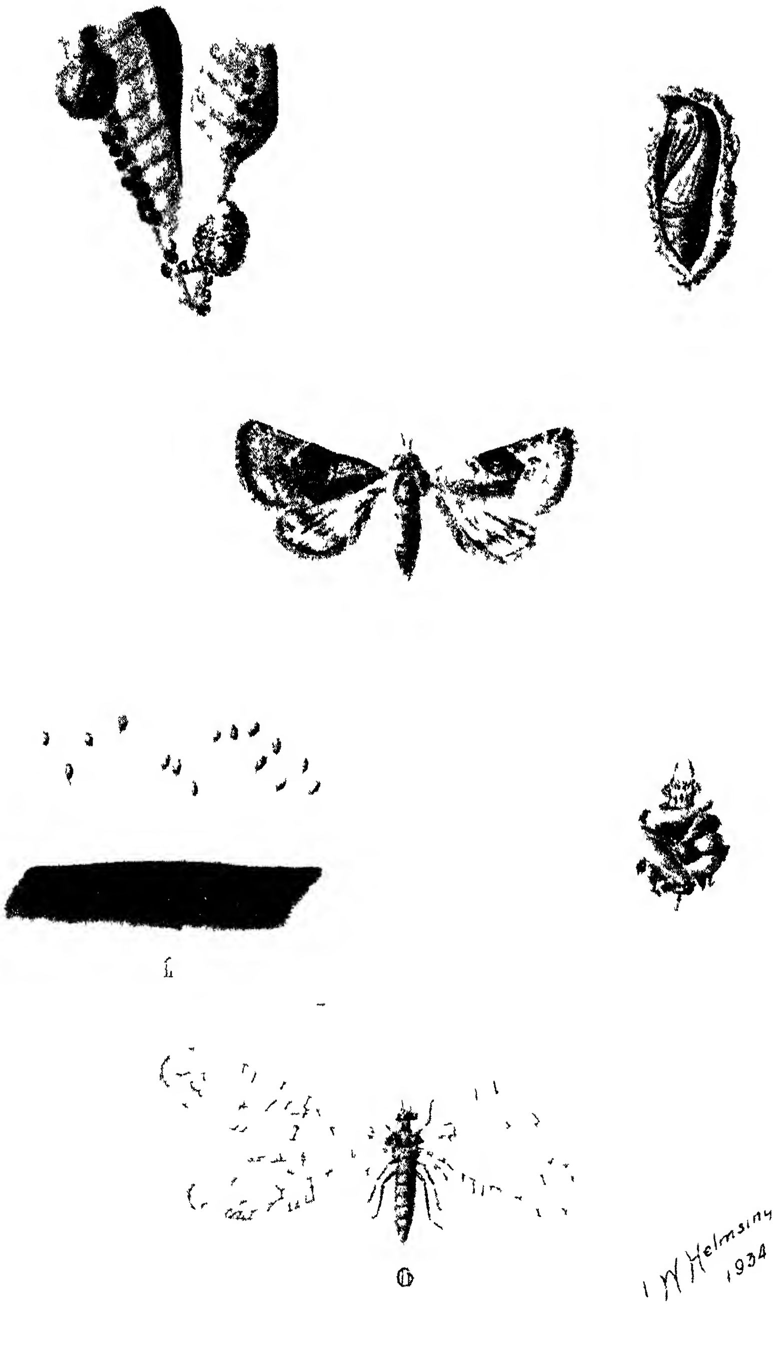

PLATE 143.

Fig. 1, Larvæ of *Catoblemma dubia* Butl. feeding on scale insects. Natural size. Fig. 2, Pupa of *Catoblemma dubia* Butl. × 3. Fig. 3, Adult of *Catoblemma dubia* Butl. × 3. Fig. 4, Eggs of the green lace wing fly, *Chrysopa signata* Walk. × 3. Fig. 5, Larva of green lace wing fly × 5. Fig. 6, Adult green lace wing fly × 3.

known, the larvæ are not. These are elongate grub-like creatures, tapering somewhat towards the posterior end, and possessing well-developed legs. Most species are black, dark-brown, or greyish-blue, but the commonest of all, *Cryptolaemus montrouzieri* Muls., is covered with a flocculent white secretion (Plate (144, fig. 5). There is little likelihood of mistaking the larvæ for other insects, and a few minutes' observation will usually reveal just what the insect is doing on a plant. The eggs are laid on the leaves as a rule, in clusters of a dozen or more, and these clusters of cigar-shaped, light-yellow eggs are familiar to most orchardists.

Undoubtedly the most useful of all Queensland ladybirds is the red-headed species *C. montrouzieri*. This insect is common throughout the State, and is almost always to be found in large numbers in any orchard. The adult insect is elongate oval in shape, being about one-fifth of an inch in length. The general colour is black, and the head, thorax, and tips of the wing covers are salmon red. The upper surface is clothed with fine hairs. Its larva has been mentioned in the preceding paragraph. The scale insects most favoured by this species are cottony cushion, Pulvinaria, and the mealy bugs.

Two other very important species are *Rhizobius ventralis* (Er.) (Plate 144, fig. 6) and *Rodolia cardinalis* (Muls.), although of recent years the latter species has rarely been observed in any numbers. The first-mentioned species, *R. ventralis,* is commonly associated with pink wax and soft scales, and against these pests it does very fine work at times. The adult of *R. ventralis* is oval in shape, about one-eighth of an inch or less in length, with the wing covers shining black and covered with light-coloured hairs. The larva is black on the upper surface. *R. cardinalis* is a very small black beetle with red markings.

Another very common species is *Orcus australasiæ* Boisd. var. *nummeralis* Boisd. It is the larger metallic blue ladybird often found amongst colonies of scale, particularly the circular black. It appears, however, to accomplish very little in the way of effective reduction in numbers, even when many are working. The smaller metallic species very commonly observed on citrus is *Orcus chalybeus* (Boisd.). The female is green and the male blue. It is a most useful species.

Lace Wing Fly.

The green lace wing fly, *Chrysopa signata* Walk., is a very beneficial insect The eggs (Plate 143, fig. 4), which are creamy white in colour, are mounted on stalks about half an inch long, and the clusters of a dozen or more eggs are found commonly on citrus leaves. The larvæ (Plate 143, fig. 5) are curious creatures, tapering towards both ends. They may be seen wandering about the colonies of scale insects with a mass of empty scales affixed to their backs, thus appearing like a mass of moving scale insects. When fully fed, cocoons are produced by these larvæ, and from these later the adult lace wing flies emerge. These adults (Plate 143, fig. 6) are delicate-bodied creatures possessing two pairs of fine, gauzy, many-veined wings of greenish hue.

Though *Chrysopa signata* attacks many species of scale, probably the best work is done against pink wax. Light infestations of pink wax may be removed, but in general the numbers of the host so greatly exceed those of the lace wing fly that little impression is made on the scale position.

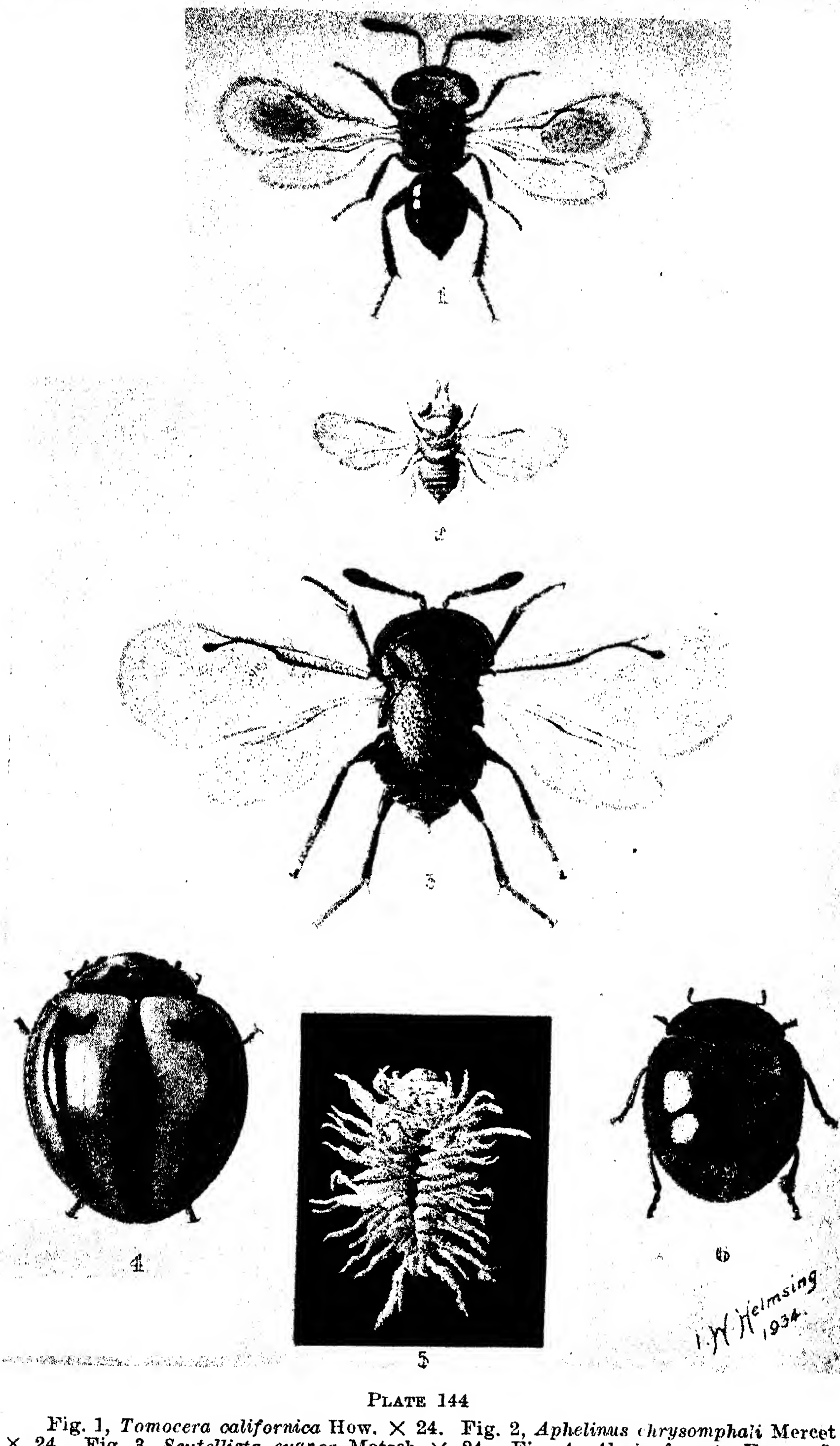

PLATE 144

Fig. 1, *Tomocera californica* How. × 24. Fig. 2, *Aphelinus chrysomphali* Mercet × 24. Fig. 3, *Scutellista cyanea* Motsch × 24. Fig. 4, *Alesia frenata* Er. × 8. Fig. 5, Larva of *Cryptolæmus montrouzieri* Muls. × 6. Fig. 6, *Rhizobius ventralis* (Er.) × 8.

Chalcid Wasps.

The parasitic wasps of the family Chalcididæ are minute four-winged creatures, rarely exceeding one-twentieth of an inch in length, and are usually much smaller. In comparison with their size they are stoutly built, and have well-developed legs. The forewings are comparatively large. Only a small proportion are native to Australia, but large numbers have been imported accidentally from other countries.

The group contains some of the most important parasites of citrus scale insects. One of the most useful species is *Aphelinus chrysomphali* (Mercet) (Plate 144, fig. 2), the small yellow wasp with conspicuous dark eyes commonly to be seen running about colonies of red and circular black scales. The wasps are particularly abundant in the late summer, and at that time of the year are often so numerous that over 75 per cent. of the red and circular black scales in particular districts are destroyed by them. When, as sometimes happens, this wasp is associated with large numbers of two other chalcid wasps, *Tomocera californica* How. and *Coccophagus iris* Gir., infestations in which every fruit carries thousands of red scales may be completely removed within a few weeks. In addition to attacking the red and circular black scales, *A. chrysomphali* is commonly bred from white louse, but in no case observed has the wasp accomplished results against this species comparable with what has been mentioned in connection with the red scale. *T. californica* is more commonly bred from hemispherical than from any other species of scale. *Scutellista cyanea* Motsch (Plate 144, fig. 3) is one of the most important chalcid enemies of citrus scales. It is very commonly bred from the hemispherical scale, and if old adults of this species are upturned and examined, the whitish larvæ of *Scutellista* will frequently be found devouring the eggs. The adult is the blue hump-back wasp commonly found amongst colonies of this and related species of scale insects. One of the most important of all the chalcid parasites is *Aspidiotiphagus australiensis* Gir. This insect attacks mussel, white louse, and circular black scales, and accomplishes much good at times, more particularly against the mussel scale. This wasp, in emerging, cuts a small round emergence hole towards the posterior end of the mussel scale.

The female wasps of this family lay their eggs in or upon the body of the host scale insect, piercing the scale with their ovipositors in much the same way as the fruit fly inserts its eggs into a fruit. The position into which the eggs are placed and the number of eggs is often characteristic of the species. A grub-like larva emerges from the egg, and after feeding transforms to a pupa, from which the adult wasp is produced. The actual method of breeding varies in different species. Some chalcids, like *S. cyanea* as mentioned above, are predatory on the eggs, and are thus free-living. Others, such as *A. chrysomphali*, the yellow wasp enemy of red and other scales, prey on the body of the scale insect but remain free and feed from the outside though attached to the body of the host. Many others pass the whole of their lives, except the adult stage, entirely within the body of the host. The adults are usually short-lived, and subsist for the most part on sweet juices, such as honey dew.

All species are not equally efficacious even if present in equal numbers. Some, of course, would be expected to be more voracious than others, but apart from this the degree of destructiveness varies. Generally parasites of the scale insect select young individuals in which

PLATE 145.

White Louse, *Chionaspis citri* Comstock, showing infestation on bark. Note predominance of males, presence of cocoons of predatory moth, and splitting of bark.

to oviposit, but in a number of cases those approaching maturity are preferred, which would, of course, be in the interest of efficiency in the case of those species feeding on eggs. In other cases it is found that the female of the scale is able to reproduce to a certain extent before death, owing to the lateness of the oviposition by the natural enemy. The rate at which a parasite develops may also be of importance, for obviously if a parasite reaches maturity very quickly in comparison with the host, there will be perhaps two or even more broods of the useful insect for each one of the harmful species.

When several species of chalcids select the one individual scale as a site for oviposition, it is possible that one or more of the species, instead of confining its attention to the scale, will prey on the other parasites present, and thus a certain degree of efficiency is lost.

Apart from such accidental hyperparasitism, there are many species of these wasps, termed secondary parasites, which are habitually enemies of other species of parasitic wasps. Thus, because a chalcid is found in a scale insect or bred from one, it does not necessarily follow that it is a useful species The question of hyperparasitism, however, need not concern the orchardist, for if numerous wasps are found operating it must mean that parasites are present and that, in so far as the scales at any particular time are concerned, the position can be summed up without reference to the actual status of each insect.

In practice it is necessary to examine the individual scales and not merely observe the colonies as a whole and the adult wasps seen amongst the scales. With the aid of a hand lens immature parasites can usually be readily made out if of any age, and, commonly, parasitised scale insects show colour variations from the normal individuals The small hole made in the scale, or the body of the soft species, by the adult parasite on emerging is usually readily seen without the aid of a lens.

Fungi.

Of the fungous enemies of scale insects in this State the red-headed fungus as *Sphærostilbe coccophila* Tul. is often styled, is by far the most commonly found. Though present in all the major citrus-producing districts, this fungus is usually of moment only in the more humid coastal parts. Even in these regions in normal times *Sphærostilbe* cannot be considered a very important factor in scale insect control. In February, 1930, in a large colony of red scale at Palmwoods over 70 per cent of the individuals were found to be attacked by this fungus. At this time the fungus was much more in evidence than usual throughout the district, but this was a very outstanding case. In normal times 1 per cent parasitism by this fungus of any host scales is seldom encountered. Red scale is the species most commonly attacked, and against this pest the value is considerably reduced by reason of its reactions to weather conditions being the opposite to those of its principal host. Thus when the scale increases the fungus decreases. It may be thought that the increase in scale is due to the decrease in fungus. Though this is probably so to a slight extent, the degree of control exercised in favourable periods does not suggest that the effect would be very pronounced if the fungus were entirely absent, and this, together with the habits of the scale, deduced from evidence from all parts of the State, suggests

that the increase is very largely independent of the fungus. Pink wax is also attacked by this fungus, and as pink wax infestations increase under circumstances generally found suitable for fungous development, it might be expected that an appreciable degree of control would be exercised in this case. This, however, is not the case, and the proportion of pink wax in any colony, either in the orchard or elsewhere, which is attacked is extremely low. The only fungus which has been found to be of much value in the control of citrus scales in this State is *Cephalosporium lecanii* Zimm. This is at times abundant, and is responsible for considerable reduction in colonies of soft scales. An undetermined species of *Podonectria* is sometimes found on mussel scale, but an appreciable degree of control of the insect rarely results. A species of *Ascheronia* attacks the hemispherical scale, causing it to become very hard and woody, and a species of *Septobasidium* is associated with mussel scale. A number of other fungi have been recorded as attacking scale insects in Australia, but these have not been found during the course of this investigation, and it would appear that they are of little or no importance in connection with scale insects of citrus.

Incidence of Natural Enemies.

Natural enemies, in common with most other insects, are not always present in equal proportions with respect to their hosts. In general, three main groups may be recognised:—

(1) Those natural enemies which are usually present in even proportions and are numerous enough to exercise a definite degree of control. Periods do occur in which insects in this group are rare, but marked fluctuations in populations are very exceptional. The red-headed ladybird, *C. montrouzieri*, is a typical member of this group, which includes most of the ladybirds. The temporary absence of these insects need cause growers no concern, and the situation is almost always rectified naturally within a very short period. In other cases, when an important species is absent for so long that the host scales increase appreciably, supplies of the enemy may usually be obtained from other districts.

(2) The second group contains those insects which annually build the population from small numbers up to a certain maximum. This group includes most of the hymenopterous parasites and the moth *C. dubia*. The latter insect, for example, is comparatively rare in the late winter and early spring. As the year progresses more and more individuals are found until at the end of summer the population may be very considerable, a drop occurring again during the winter months. In most cases the extent to which the useful insects are present is more or less proportional to the strength of the host colonies. This, however, is not an invariable rule. As the natural enemies of Queensland citrus scale insects are widely distributed and thoroughly acclimatised, little can be done to remedy any undesirable position with regard to the insects in this group, and for the most part any absence of a species known to have been in a particular district will be quite temporary.

(3) The third group includes those species which are normally present in small and, for the most part, negligible numbers, or which may generally be entirely absent, but on occasions arrive in very considerable numbers. Such species may at times do wonderful work,

though in general their value is very small. The outstanding example of this group is the ladybird *Alcsia frenata* Er. (Plate 144, fig. 4). This insect is ordinarily comparatively rare in citrus orchards, but at times the numbers become so great that the beetles may be seen in layers two or three deep in parts of the tree, and large trees may be so thickly covered that it is scarcely possible to insert the point of a pin between the insects anywhere on the plant. The group also includes a number of species of ladybirds and chalcid wasps.

These three groups are more or less well defined, but gradations will frequently be found.

The fluctuations in populations are brought about mainly by climatic influences or factors which are directly connected with climatic variations. For the most part the natural enemies of scale insects do not confine their attentions to one species of scale, but attack not only several species which feed on citrus, but other non-citrus feeding scales also. The natural enemies, of course, will follow the host scales wherever possible, and thus any abnormal happening such as the destruction of a large area of wild host plants of the scales attacked may be quickly reflected in the position in the orchard.

A list of the natural enemies observed during the course of this work will be found in Table I.

TABLE I.

Natural Enemy.	Most Favoured Hosts	Remarks
COCCINELLIDÆ OR LADYBIRDS.		
Cryptolæmus montrouzieri Muls.	Cottony cushion, Pulvinaria, and mealy bug	Probably the most useful scale insect enemy.
Rhizobius ventralis (Er.) ..	Pink wax, white wax, soft brown, and other soft species	A common and most important enemy of many species.
Orcus chalybeus (Boisd.) ..	Red scale and circular black	Common and very useful.
Orcus australasiæ Boisd. var *nummeralis* Boisd. ..	Circular black ..	Common but not generally very effective
Scymnus notescens Blkb. ..	Pink wax	Very common and most useful.
Scymnus sp. (?)	Pink wax	Minute shining ladybird; very common and useful; may prove to be a *Rhizobius*.
Neda testudinaria Muls. ..	..	Not common.
Platyomus lividigaster Muls. ..	..	Common.
Serangium maculigerum Muls. ..	..	..
Rodolia cardinalis (Muls.) ..	Cottony cushion ..	Does excellent work when in numbers, but not very common.
Alesia frenata Er.	..	See note in text.
CHRYSOPIDÆ OR LACEWING FLIES.		
Chrysopa signata Butl. ..	Pink wax ..	Very good but not usually present in sufficient numbers to accomplish appreciable control.

TABLE I.—*continued.*

Natural Enemy.	Most Favoured Hosts.	Remarks.
CHALCIDOIDEA OR CHALCID WASPS.		
Aphelinus chrysomphali Mercet.	Red, circular black, and white louse	A most useful species.
Coccophagus iris Gir.	Red scale	..
Tomocera californica How. ..	Red, white wax, and hemispherical scales	Very common.
Rhopalencyrtoidea dubia Gir. ..	Red scale	..
Aspidiotiphagus australiensis Gir.	Red, circular black, pink wax, white louse, and mussel	A most useful parasite.
Metaphycus lounsburyi (How.). ..	Olive scale	Appears to be the parasite mainly responsible for the unimportance of this scale.
Metaphycus flavus How. ..	Soft brown	..
Metaphycus varia Gir.	Pink wax and Pulvinaria	..
Aphycus verdini Gir. ..	Soft brown	..
Cheiloneurus sp.	..	Probably a secondary parasite.
Diversineurus elegans Silvestri ..	..	Secondary parasite commonly bred from hemispherical scale colonies.
Paræenasomyia listzi Gir. ..	..	Secondary parasite. Recorded from *S. cyanea* and *T. californica.*
Aphelinus sp.	Soft brown	..
Marietta distomata Gir. ..	..	Thought to be secondary parasite.
Ophelosia crawfordi Riley ..	Cottony cushion ..	..
Coccophagus sp. .. .	White louse	Not common.
Eucomys sp.	Soft scale .. .	Possibly primary parasite.
Tetracnemastix abnormis Gir. .	Pulvinaria . ..	Not common.
Signophora perpauca Gir. .	..	Secondary parasite obtained from Pulvinaria.
Scutellista cyanea Motsch. ..	Hemispherical and olive scales	An important enemy of these species.
Encyrtis spp.	..	A large number of species, many apparently undescribed, of this genus were obtained, but the exact status of each not determined. Probably many are secondary parasites.
NOCTUIDÆ OR MOTHS.		
Catoblemma dubia Butl. ..	White louse, circular black and red scales	A most important enemy of the first-named scale.
Catoblemma sp.	Soft brown	..
FUNGI.		
Sphærostilbe coccophila Tul. ..	Red and mussel scales	*See* note in text.
Microcera sp.	Pink wax	*See* note in text.
Cephalosporium lecanii Zimm. ..	Soft scales	*See* note in text.
Podonestria sp.	Mussel scale	..
Septobasidium sp.	Mussel scale	..
Ascheronia sp.	Hemispherical scale ..	Fairly common, but of doubtful value as only old individuals appear to carry the fungus to any extent.

ATTENTION TO FACTORS LIMITING INCIDENCE OF SPECIES.

The control of a pest in a commercial orchard may entail much more than killing a large percentage of the pest present at a particular time. Economic considerations demand that the trees remain commercially free of the pest for the longest possible period. With insects such as those now under discussion, which produce rapidly and prolifically, the most effective insecticide may accomplish little towards true control of the pest. In the case of red scale, for example, orchards have been seen in which repeated application of the best known scalicide for the purpose have failed to maintain a control of the pest for more than a few weeks, and where, had the problem been approached from the point of view of the trees, the insect could have been reduced to insignificance in a very short time. The application of scalicides, even at appropriate times, does not constitute the whole of the combative work which can be done against scale insects, and, in fact, in some cases may not form a necessary part of that work.

Growers have always found, and will continue to do so, that the same treatment does not give equally good results against a pest on every orchard or in every year. The explanation of this inconsistency is frequently to be accounted for by the habits of the pest, and not, as is very commonly assumed by orchardists, by variations in the insecticidal materials. If the habits of the various species of scale insect are studied it will be seen that each one thrives under certain circumstances and is of little or no importance under others. Some of these conditions are fixed or cannot be altered at will, but with others the influence can be minimised or magnified to some extent by the grower as he may himself desire. The extent to which a knowledge of the factors can be used in the control of scale insects is rarely recognised, and the first recommendation for the control of all scale pests is for orchardists to become familiar with the habits of the insect and thus be in a position to offset as far as possible influences which tend to increase populations of the pest and assist or create those which discourage the insects.

The nature and manner of working of outstanding factors are included in the discussion on the control of each species, but it is impracticable to include all. The way in which the knowledge of the habits may be applied varies from orchard to orchard, and cannot be dealt with in detail. At all events, growers are in the best position to decide the details of how they will proceed to obtain the desired objective, which is to minimise the number of scale insects which they will have to combat actively by reducing the probability of infestation. It may be a matter of judicious pruning, application of fertilizer, irrigation practice, drainage, or any other point having bearing on the health of the trees. For example, it is known that red scale multiplies most prolifically in hot, dry times, and it is desirable to establish artificial control as late in the summer as possible. When the normal monsoonal rains occur, the application of control measures for this species may be left until late March or even early April. If, however, the rains are delayed or are very light the pest may increase so much that the trees begin to suffer. At times growers fumigate at once to save the trees, only to find that,

owing to the period still elapsing before breeding appreciably slackens, the trees are not commercially clean at harvesting time. However, it has been shown exeperimentally that by extra watering not only are the trees better fitted to carry the scale population but that its rate of increase can be definitely lowered. Thus the control can be delayed until the correct time and a reasonably permanent commercial freedom from the pest established without any great detriment to the trees.

The point to be remembered is that scalicides are often only complementary and not sole methods of combating scale insects.

[TO BE CONTINUED.]

A Blowfly Specific.

A PREPARATION of this description should be an antiseptic as well as a healing agent, and afford some protection to the sheep or lambs, to prevent maggots developing from a future strike Apart from this, there are the wool scourer and manufacturer to be considered, for much trouble, inconvenience, and actual loss is incurred if the specific applied cannot be scoured out successfully. With a view of coming somewhere near these combined qualities with a mixture fairly reasonable in price, the following is recommended for use:—

Ingredients.

40 per cent. Shell Dieselene Oil or Vacuum 28-38 fuel oil;

55 per cent. herring or cod oil,

5 per cent. cresylic acid;

0.1 sodium arsenite, or 1 lb. to 100 gallons.

For the convenience of making 5 gallons of the mixture, take 22 pints cod oil, 16 pints fuel oil (not more than 875 specific gravity), 2 pints cresylic acid and 1 oz. sodium arsenite.

To Mix.

Place the 22 pints of cod oil in a 5-gallon drum and add the 1 oz. sodium arsenite; shake well, then add the cresylic acid and fuel oil. Should the weather be cold, heat at least some of the cod oil and add the sodium arsenite; shake well, and add the other ingredients as above.

The mixture should be well shaken before using, and shaken up occasionally while in use, and applied with a brush or swab.

The conditions under which the ingredients were purchased allowed the specific to be sold, including the container and freight, at 3s. per gallon.—JAS. CAREW, Senior Instructor in Sheep and Wool.

The Soil Population.*

By H. W. KERR.

A CAREFUL examination of a Queensland cane soil immediately reveals its essentially mineral character. It would be found on analysis that at least 90 per cent. of the dry mass of any such soil consists of disintegrated and decomposed rock minerals, while in most cases this proportion would rise to 95 per cent. However, were a soil nothing more than the altered remains of some ancient rock, it would be quite worthless agriculturally. Such a lifeless, inert mass is entirely incapable of supporting crop growth, and we find that the fertility of the soil is intimately associated with that small residue—some 5 or 10 per cent.—which is not of mineral but of organic origin.

From the earliest times this fact has been appreciated by agriculturists. The earliest writings of which we have record stress the necessity for working into the land farmyard manure or other decomposing crop residues in order to increase its fertility. However, the true function and behaviour of these materials in the soil presented a problem the solution of which was discovered only in very recent times. It was in 1877 that two famous French chemists first demonstrated the manner in which nitrogen is made available to the crop in the form of nitrate; they proved conclusively that this process is effected by a select group of minute organisms which inhabit the soil, and their researches provided the stimulus for a most intensive study of similar reactions which take place in the soil. In the short space of the ten years 1880 to 1890, many new facts were brought to light, which demonstrated most convincingly that the soil possesses its peculiar population of minute organisms; and the work of more recent times has provided us with a clearer picture of their life processes, and the important part they play in soil fertility and crop nutrition. It is the purpose of this paper to trace briefly the manner in which these organisms obtain and consume their food, and the nature of the by-products of their work. Doubtless this subject provides one of the most fascinating chapters of the romance of the soil; and it is one of much greater importance to the agriculturist than is generally supposed.

THE SOIL BACTERIA.

When one speaks of bacteria or fungi, the lay mind immediately conjures up visions of dread diseases of man, beast, or plant, in their many and sinister forms. Yet the number of micro-organisms responsible for visitations of this nature constitutes, fortunately, a very small minority; and by far the greater number of "microbes," as they are popularly known, are the friends of man; they are ever busy in his service, destroying the waste remains of animal and plant life, and without whose aid the earth would be so littered with the corpses and plant remains of bygone centuries that life as we know it would be quite impossible. The soil is the native habitat of these helpful types. To give some idea of their widespread nature and the immensity of their number, it may be stated that a teaspoonful of rich garden loam contains as many as 100,000,000 of bacteria! Yet each is so minute

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* Reprinted by permission from Proceedings of the Fifth Annual Conference of the Queensland Society of Sugar Cane Technologists, Cairns, March, 1934.

that when magnified 1,000 times it appears only as a small sphere or rod which is just clearly discernible, and the myriads of these tiny forms of life to be found in an acre of such a soil would weigh a mere 50 lb.

The soil bacteria have been the subject of intensive study for the past fifty years, and it is now known that they are extremely varied both in detailed form and in the nature of the work which they perform. It should be stated, from the outset, that we are not at all interested in their individual shapes or sizes, or in the bewildering names under which they labour. We are interested only in their work, and the relationship of this work to the soil and crop. Suffice it to say that the bacteria constitute the simplest forms of life. Whereas the "bodies" of the higher plants and animals are built up of numerous tissues, each composed of its many individual cells, the bacterium is a "single-cell" individual. That is to say, this organism, composed of one simple cell, is able to perform the essential functions of life for which the tissues and organs of higher forms of life are so specialised. Reproduction is effected by the simple expedient first of elongation of the cell, after which it divides in the centre to produce two individuals. The speed with which bacteria may thus increase in numbers, under favourable conditions, is truly amazing. The entire process of cell division, as it is called, may occupy only a brief half hour, so that if the process were repeated over a period of fifteen hours, it is possible for a single cell to give rise to 1,000,000,000 individuals! It will be evident that natural conditions never allow such excessive multiplication; but this calculation demonstrates how the numbers of active individuals may grow when food supply and other growth conditions are suitable.

FOOD SUPPLY.

It is a difficult matter to decide whether bacteria should be regarded as plants or animals; they possess habits which might cause them to be placed in either category, but they are usually regarded as resembling rather the plant kingdom. We will, therefore, look upon each bacterium as a minute plant, and study its life functions in some detail. Like the higher plants, they must have food for their growth and reproduction; but whereas green plants are able to manufacture their own foods—that is, sugars, starches, proteins, and so on—bacteria are entirely dependent on an outside source for their needs. It is in this respect that we find them of special interest, for they derive their food from the plant and animal residues which find their way to the soil, and it is this process of "decay" or decomposition which we should clearly understand, if we would appreciate the true benefits derived from the work of the soil population.

Now, these plant and animal remains are decidedly complex in their make-up. As the bacterium possesses no internal digestive system, how is it able to deal with the substances contained in the organic matter? Obviously, the food must be brought into solution before it can be absorbed through the delicate cell-wall which surrounds the organism. In point of fact, this is accomplished by the secretion of special "digestive juices" which are able to attack and dissolve the organic matter. Furthermore, all groups of bacteria are not capable of dealing with the same classes of substances, just as we find that the higher animals for example, are specialised in their food requirements.

DECOMPOSITION OF GREEN MANURE AND TRASH.

As regards the simple sugars—which are readily soluble in water—we find that they are suitable sources of food for almost all types; but as the composition of the organic substances becomes more and more complex, the specialised behaviour of the respective groups of micro-organisms becomes more clearly defined. These facts have a most important bearing on the mode of organic decay in the soil, and to illustrate the point let us consider the decomposition of, firstly, a crop of legumes, and secondly, of a mass of cane trash ploughed into the land. If the green manure crop be turned under when in a succulent condition, it presents a most favourable source of food. The sugars in which it abounds are eagerly devoured by the many soil organisms; the starches and proteins which constitute the bulk of the remainder offer but little resistance to decomposition and the soil population undergoes rapid multiplication due to the favourable food conditions presented. As a consequence, the heavy mass of green matter almost completely disappears in the course of three or four weeks; the only visible remains are the relatively small amounts of woody stems which offer stouter resistance to decomposition, but they eventually break down also under the persistent attack of specialised groups of organisms.

Consider now what happens when a mass of dry trash is ploughed under. This material is notably deficient in the readily "digested" sugars and starches, and is composed to a great extent of the more complex and resistant compounds, whose decay is far less complete, over a given period. There is another point of dissimilarity between these two sources of bacterial food. Like all plants, the bacteria demand a supply of available nutrients (or *plantfoods* as they are often called), if they are to grow and function successfully. As far as possible the bacteria derive their nutrients from the organic matter on which they feed, and with the succulent bean or pea crop they are abundantly provided for in this respect. Trash, on the other hand, is far from favourable, and it must be regarded as a highly "unbalanced" food; naturally, then, the bacteria must seek elsewhere in order to make up the deficit in plantfoods, and they turn to the available supply of the soil. It is usually found that nitrogen and phosphate are in greatest demand, which explains why an application of these nutrients in the available condition (for example, as sulphate of ammonia and superphosphate) effects a marked stimulus in the speed of rotting of a compost heap of moist trash.

It is evident that the trash decomposition will thus result in a temporary depletion of the soil's nutrient supply, and this provides a ready explanation of the oft-experienced fact that the ploughing under of a mass of cane crop residues induces most unfavourable growth conditions for our economic crop, while the rotting is in progress. Eventually, however, the nutrients absorbed in the process, together with those contained in the trash originally, become available once again for crop nutrition; but the temporary evil effects may be most serious, when, for example, the trash from a crop of plant cane is ploughed under at ratooning time. The practice is a bad one, particularly in dry areas, as the rotting process also depletes the soil moisture supply. It is much better to put the trash to good use in the form of a soil mulch, to complete a measure of its rotting on the land surface during the wet season; and when the ratoon stubble is eventually ploughed out, the process is completed in the soil while the land is in

fallow. That a green manure crop ploughed under at this time speeds up the rate of decomposition, is explained by the fact that the legume provides an abundance of available nitrogen for the bacteria which perform the work.

It is thus evident that the nature of the reactions which the soil bacteria carry out depends to a very large extent on the nature of their food supply. But in any case, the net effect of their labours is to reduce plant and animal remains to the simplest state. The end products are largely carbonic acid gas and water, while in the decomposition process the soil nutrients such as nitrogen, phosphate, lime, and potash, are again released and made available for crop nutrition. This in itself is a most commendable service which should earn for the soil population the lasting gratitude of the agriculturist. But there is a further aspect to this process of decay which is of even greater importance in that it confers more lasting benefits on the land.

SOIL HUMUS.

It was stated that most plant and animal tissues eventually succumb to the sustained attack of the "digestive juices" secreted by one or another group of soil bacteria. It should now be added that one peculiar class of plant substance is, however, able to withstand this onslaught in a large measure, and emerges from the attack with but slight modification to its original state. These interesting substances are known as *lignins,* and they constitute a large proportion of the "woody" parts of plants. As the result of the operations of the soil organisms, the original identity of these tissues is definitely altered, and they emerge as dark-coloured compounds, collectively and popularly known as *humus*. It is scarcely necessary to stress the value of this compound, and its influence on the chemical and physical properties of the soil. It is this substance which is largely responsible for that favourable granular soil structure so characteristic of a rich garden loam; it exercises a profound influence on the moisture-holding capacity of the soil, and confers on the land a marked degree of drought resistance. Whereas a sandy soil is capable of retaining about one-sixth of its weight of moisture, humus is able to hold twice its weight of water. A soil rich in humus does not pack readily in times of heavy rainfall, and a subsequent light cultivation usually suffices to restore it once more to a condition of good tilth. It possesses the power of holding large amounts of plantfoods in a readily available state, in addition to the fact that practically the *entire* nitrogen supply of the soil is a constituent part of the humus*, from which condition it is made available to our economic crop, through the process of slow decomposition effected by the soil bacteria. It is for this reason that a mass of decayed rock minerals cannot support plant life—it is totally devoid of nitrogen, an essential plantfood material.

When the above properties of humus are carefully reviewed, there is no agriculturist who would not agree that this is far and away the most important soil constituent; and it is particularly unfortunate that our Queensland cane soils are extremely deficient in this compound.

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* Strictly speaking, this statement applies to the entire organic matter supply of the soil, and not alone to the more specific class of compound defined above as *humus.*

The reason is not difficult to determine. Our coastal areas are notable for their uniformly high temperature conditions, together with an abundant rainfall. This combination of factors entirely favours the rapid and complete decomposition of organic matter in the soil. Moreover, high annual rainfall also promotes a rapid removal of plantfoods, one of which in particular—that is, *lime*—is of very great importance in fixing the humus in the soil. When this nutrient is lacking, the humus is freely carried away in the drainage waters. This is amply demonstrated by the brown-coloured waters so commonly observed in many of the creeks and swamps of our poorer coastal forest lands.

Under these conditions it is evident that the problem of maintaining the organic matter content of the soil is a serious one, and is associated in no small measure with the rapid decline in fertility which so commonly follows the breaking up of our cane lands. The process of intensive cultivation which accompanies cane production is most favourable in its influence on the rapid depletion of humus. The growing crop profits from the latter process, but it is effected at great expense to the land. It has been stressed repeatedly that green manuring once in four years cannot be expected to contribute markedly to the permanent supply of soil organic matter, valuable though the practice is from other standpoints. The rapid and relatively complete decomposition of a succulent leguminous crop results in the production of but little humus, owing to the low proportion of lignins in its makeup. The only substances available to the cane grower to help him in his difficulty are the residues of the cane crop itself—that is, the oft-abused tops and trash which, in a wet harvesting season at least, are regarded simply as an unmitigated nuisance. The slow and incomplete decay of this material in the soil is a distinct advantage in this respect, and owing to its relatively high lignin content, a reasonable proportion of humus results. Even the consistent conservation of all available trash over a period of, say, twenty years, however, cannot be expected to enrich the soil permanently to the extent of more than 1 or 2 per cent. of humus. But what an improvement this would effect on many of our run-down soils!

OTHER SOIL ORGANISMS.

So much, then, for a brief and totally inadequate description of the economy and life work of certain of the soil bacteria. Nothing has been said of those specialised forms whose duty it is to convert ammonia to nitrates; or of those busy little organisms which are able to abstract the nitrogen gas from the atmosphere, and build it up into forms of nitrogenous compounds which ultimately become available for crop nutrition; or of the species which enters the roots of leguminous plants, where it obtains its supply of sugars for growth, providing in return nitrogen for the requirements of the host plant, the two living in a state of perfect harmony and co-operation. Again, there are those harmful groups of bacteria which thrive in water-logged soils only, and produce compounds which are in the nature of poisons to our economic plants, and dissipate the nitrogen supply of the land. We have said nothing as yet of the fungi, the yeasts, the protozoa which consume living bacteria, and of other minute soil organisms which also play a most important part in the processes of decomposition. Indeed, many of the reactions which have been credited to the labours of the bacteria are in reality the work of these associated forms. However, sufficient has been said to indicate that the "social organisation" of the soil

population is quite as complex as that of the human race. They lead a quiet existence in a state of peaceful contentment while the soil is in its normal state. True, the relative numbers of each class vary considerably with variations in local conditions; but the economy of the entire population is rudely disturbed when a lavish supply of available food is suddenly turned over to them. If it should be, for instance, an application of molasses or other highly available food, the fungi first increase in numbers at a tremendous rate, and permeate the soil mass with their downy, thread-like bodies; as suddenly, the food supply is finally consumed, and wholesale destruction of the fungi results. Their body tissues now serve as food for the several bacterial types, which are temporarily favoured by a wealth of food for energy and growth. They are, in turn, rapidly reduced in numbers when this stage of the decomposition is completed. And so through the successive stages, until finally the plant foods added in the molasses are again made available for plant nutrition, while the soil gains a residue of the difficultly decomposable substances which are produced, or remain following the decomposition, to become associated with the soil humus, and the soil population again pursues the relatively even tenor of its way.

CONCLUSION.

We must, therefore, regard the soil as a *living* system in which the minute forms of life are ever active, and the results of whose interesting reactions are of such vital importance to the farmer. They pursue their labours for twenty-four hours a day, and seven days in a week; yet they demand as their reward only the waste residues of the crop so worthless to the farmer. Surely they must be regarded as his most efficient workers, whose well-being is worthy of closer attention than is usually their lot.

TO NEW SUBSCRIBERS.

New subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some new subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and new subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

Vinca Rosea.

A REPUTED CURE FOR DIABETES.

By C. T. WHITE, Government Botanist.

In the "Queensland Agricultural Journal" for February, 1925, I wrote an article on the reputed value of *Vinca rosea* as a cure for diabetes. The article was reprinted or referred to in many newspapers and magazines, with the result that a big correspondence resulted and the available stock of reprints soon became exhausted.

Since the article was written the plant has gained a great deal of favour, and some rather wonderful accounts of its value as a curative agent have been given to me.

It was Mrs. H. N. Uffindell, of Lower Mitcham, South Australia, who first drew my attention to the use, in South Africa, of the herb Vinca as a cure for diabetes. Mrs. Uffindell, hearing that the plant was a common weed in Queensland, wrote requesting a supply of leaves, and at the same time enclosed a cutting from a South African paper giving the following directions for the use of the plant.

Vinca Treatment of Diabetes.

Each day boil twenty-seven leaves in three and a-half cups of water for fifteen minutes, then strain. Take one cup after each meal; one hour afterwards as much bicarbonate of soda as can be got on a sixpence in half a glass of warm water. Diet consists of all green vegetables, meat three times a day, game, fowl, or bacon for a change, some apples. Avoid ordinary bread.

In South Africa, Mr. E. E. Whyte, the discoverer of the value of Vinca in diabetes, has put up a proprietary medicine termed "Covinca," for which it is claimed that eight out of every ten cases of sugar diabetes will find the use of Insulin and strict dieting unnecessary.

As the plant is a very common weed in Queensland, the following description and accompanying illustration are published for the use of sufferers who may care to make a trial as to the efficacy or otherwise of the plant. It most commonly occurs along sandy beaches, particularly from Maryborough northwards; about Brisbane and more southern localities it is not so common, but may often be seen as a stray from garden culture.

Two varieties or forms occur, the one with pink (the type) and the other with white flowers (var. *alba*); the properties are most probably the same in both.

Description.—A perennial herbaceous plant 1 to 2 ft. high. Leaves arranged in opposite pairs, elliptic in outline, 1½ to 2½ in. long, nearly 1 in. broad tapering at the base to a short stalk of about ¼ in. Flowers borne in the uppermost leaf axils; calyx green about ¼ in. long divided to about the middle into five narrow lobes; corolla with a slender tube a little over an inch long dividing at the apex into five flat pink or white

PLATE 146.
VINCA ROSEA, A REPUTED CURE FOR DIABETES.

lobes 1½ in. across; lobes obovate rather lop-sided, much narrower towards the base. Seed capsules in pairs, long and narrow, about 1¼ in. long, full of small back oblong seeds, each seed about one line long.

Distribution.—A native of the West Indies and Tropical America, now naturalised in most of the warmer parts of the world.

Common Name.—Species of the genus Vinca are commonly known as Periwinkle.

Botanical Name.—*Vinca,* from the Latin *vinculum,* a bond or fetter, in allusion to the twining shoots of some species of the genus; *rosea,* Latin, referring to the pink colour of the flowers of the type.

Botanical Reference.—*Vinca rosea* Linnæus, species Plantarum 305.

QUEENSLAND SHOW DATES, 1934.

June.

Gayndah, 13th and 14th
Gladstone, 13th and 14th
Wowan, 14th and 15th
Rockhampton, 19th to 23rd
Mackay, 26th to 28th
Laidley, 27th and 28th
Proserpine, 29th and 30th
Townsville Rodeo, 30th

July.

Bowen, 4th and 5th
Gatton, 4th and 5th
Kilcoy, 5th and 6th
Ayr, 6th and 7th
Townsville, 10th to 12th
Woodford, 12th and 13th (Sports only)
Rosewood, 13th and 14th
Cleveland, 13th and 14th
Cairns, 17th to 19th
Charters Towers, 18th and 19th
Caboolture, 20th
Barcaldine, 24th and 25th
Nambour, 18th and 19th
Atherton, 24th and 25th
Esk, 27th and 28th
Pine Rivers, 27th and 28th

August.

Royal National, 6th to 11th
Home Hill, 31st August and 1st September

September.

Enoggera, 1st
Imbil, 7th and 8th
Ingham, 7th and 8th
Pomona, 12th and 13th
Innisfail, 14th and 15th
Mareeba, 20th and 21st
Beenleigh, 20th and 21st
Rocklea, 22nd
Malanda, 26th and 27th
Kenilworth, 29th

October.

Southport, 5th
Millaa Millaa, 5th and 6th
Tully, 12th and 13th

Wheat Varieties in Queensland.

H. W. BALL, Assistant Experimentalist.

IT is considered that wheat farmers will be interested in the relative popularity of wheat varieties grown in Queensland. A census supplied by the State Wheat Board discloses that in 1933 Florence was the most widely grown variety.

Florence has been popular for many years, owing to its ability to yield well over a wide range of soils and climatic conditions. If seasonably sown, it will usually escape rust. Its chief defect is a tendency for the grain to shell in the field when ripe.

To illustrate the changing preference of farmers in recent years the following figures are noted:—

Variety.	Percentage of Total Area Sown from 1929 to 1933.					Area of each Variety in 1933.
	1929.	1930.	1931.	1932.	1933.	Acres.
Florence	11·0	8·64	12·35	14·37	14·95	46,401
*Flora	..	..	1·91	7·18	12·32	38,240
Clarendon	8·9	9·08	16·54	14·07	10·57	32·812
*Three Seas	..	2·4	5·87	6·29	10·51	32,631
Pusa	23·4	28·9	14·47	12·50	9·99	31,023
Gluyas	7·3	6·02	..	6·31	7·93	24,616
*Cedric	7·0	4·85	4·38	6·44	6·83	21,223
Nabawa	..	1·45	..	6·17	4·77	14,715
*Novo	..	3·12	2·09	2·56	3·48	10,800
Cleveland	5·5	..	3·91	3·95	4·37	13,551
Warren	5·6	4·54	3·41	2·57	2·59	8,049
Currawa	8·6	13·74	10·29	2·64	2·27	7,058
*Amby	..	1·68	..	..	1·22	3,780
*Duke of York	..	4·78	..	1·52	1·03	3,198
*Warchief	..	1·17	..	1·05	1·22	3,789
Canberra						
Waratah	..	2·67	..	..	..	..
Varieties having smaller percentage than those noted	22·7	6·96	24·78	12·38	5·95	..

* Denotes Queensland bred wheat.

Of particular interest is the fact that the area of wheat sown to varieties bred by Mr. R. E. Soutter, at the Roma State Farm, has now risen to 37 per cent. of the total.

Flora, with 38,240 acres, has moved up to second place. It is a short-strawed wheat of excellent grain quality, which does not shell so readily as Florence when ripe.

Three Seas, a bearded rust-resisting type, is represented with 32,621 acres.

Seafoam, recently released for cultivation, is a similar type to Three Seas but has better quality grain.

The area sown to Seafoam is likely to increase in the near future.

Pusa has lost acreage evidently owing to its susceptibility to damage by frost.

Currawa has also lost ground, and owing to its slow-maturing habit, is now chiefly grown by those desiring to feed off the early growth to sheep.

Nabawa, which is now the leading variety in New South Wales and West Australia, was represented in Queensland with 14,715 acres.

The high proportion of such good quality wheats as Flora, Florence, Pusa, Cedric, and Novo now grown in Queensland is particularly fortunate.

Farmers grow these wheats, not because of the quality but because they yield well under Queensland conditions.

Looking to the future, if production can be continued at a profit, this State should have an export surplus of wheat within the next decade, when our wheats should be more eagerly sought after than the softer wheats grown elsewhere.

GETTING READY FOR MAIZE—IMPORTANCE OF EARLY PLOUGHING.

Deep early ploughing and winter fallow are the most important cultural factors in the growing of maize. Under most conditions this first ploughing should take place in the autumn or early winter. It is almost an invariable rule that, other things being equal, the land that has received the longest preparation gives the best returns. The following results have been obtained from experiments at Grafton Experiment Farm (N.S.W.) averaged over four years:—

	Yield per acre.	
April ploughed	70 bus.	21 lb.
June ploughed	62 „ . .	37 „
August ploughed	55 „	2 „

Land ploughed at the period recommended and left in the rough state during the winter is greatly benefited by the mellowing action of frosts, and is open to receive the winter rains, both of which penetrate more deeply into the soil and subsoil. This, with the greater aeration of the soil, materially improves the soil's chemical and physical character, especially if the ploughing be deep and thorough.

Where undulating land is left unploughed during the winter, much of the rainfall is lost by running off the hard surface. Most of this could be conserved if the land were deeply ploughed and left rough. On hillsides and where the winter rains are excessive it may be found advisable to plough the land in autumn and plant a cover crop like peas, clover or rape to cover the ground during the winter and prevent erosion of the soil. In all cases where hillside land is cultivated it is preferable to plough and plant across the slope of the hills in order to save the soil from washing.

On flat lands that drain poorly recourse may often be had to ploughing the ground in narrow strips about 8 feet or 12 feet wide, on which two or three rows of maize are planted, with a "dead" furrow or open drain between each strip to carry off the surplus moisture.

Malting Barley.

TOWARDS the end of 1932, to satisfy a general desire expressed by barley-growers for a change of seed of malting varieties, the Department of Agriculture obtained small quantities from England of the following varieties of malting barley:—Winter Archer, Spratt Archer, and Plumage Archer.

Similarly, the Queensland Barley Board interested itself in obtaining supplies of seed of Plumage Archer from Tasmania.

The three barleys imported by the Department were subjected to analysis on arrival and were placed with two well-known barley-growers at Nobby for propagation purposes. Similarly, the varieties from New Zealand were submitted for analysis and germination test.

Owing to the fact that climatic conditions obtaining during the period of harvesting, or immediately prior thereto, were adverse for the production of a first-class malting barley, the protein and carbohydrate content of this season's barley have been affected. Coincidentally, climatic factors have more or less affected the germination of these barleys. The following tabulated information will give some indication of the change that has taken place:—

——	Moisture.	Protein.	Fat.	Carbohydrate.	Fibre.	Ash.	Germination.
1932.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
*Spratt Archer ..	12·0	8·6	1·3	71·7	4·1	2·3	98
†Plumage Archer..	14·8	8·1	1·1	68·9	4·8	2·3	80
†Spratt Archer ..	13·7	7·7	1·3	70·8	4·3	2·2	82
†Winter Archer ..	14·2	7·6	1·3	70·3	4·3	2·4	79
1933.							
*Spratt Archer ..	11·1	9·8	1·3	70·2	4·9	2·7	98
*Plumage Archer..	13·6	11·8	1·4	65·7	4·9	2·6	88
†Spratt Archer ..	13·6	12·3	1·2	65·3	5·2	2·4	97
†Plumage Archer..	14·3	15·2	1·2	61·7	5·1	2·5	85
†Winter Archer ..	13·6	12·2	1·0	65·7	4·8	2·7	76

*Ex New Zealand. †Ex England.

It is, however, anticipated that these barleys grown under normal seasonal conditions will show considerable improvement over the results given, and farmers who have grown any of them are recommended to continue their growth for at least another season.

If you like this issue of the Journal, kindly bring it under the notice of a neighbour who is not already a subscriber. To the man on the land it is free. All that he is asked to do is to complete the Order Form on another page and send it to the Under Secretary, Department of Agriculture and Stock, together with a shilling postal note, or its value in postage stamps, to cover postage for twelve months.

The Selection of Seed Maize.

By C. J. McKEON, Instructor in Agriculture.

As harvesting is now in progress, and as it is just prior to or during harvesting that the selection of seed for next season's planting should be made, Mr. McKeon's notes on the selection of seed will be of interest to those growers who have pure strains of a high-yielding variety which has proved suitable for their particular locality and who are desirous of obtaining their requirements for the next season's planting from their own crops.—ED.

ANY grower who practices careful seed selection is well repaid for the small amount of extra labour which this entails, and the high quality of much of the maize that is now being produced in the various districts goes to prove that a large percentage of growers are fully alive to this and also to the wisdom of growing only proved high-yielding pure strains.

Growers who have not a pure strain of a high-yielding variety known to be suited to their particular locality, and who are desirous of having them, should be sure that they are getting their seed from a reliable source, otherwise the resultant crops will probably prove to them that the crop from which the seed was selected was grown in close proximity to a different, and probably mixed, variety, and that cross fertilization had occurred.

Growers in closely settled districts frequently experience trouble in keeping varieties pure owing to cross fertilization with other varieties growing on adjoining farms, as a result of the pollen being borne by wind and insects from one crop to another. This can only occur, however, when crops tassel at the same time and a difference of a few weeks between the plantings is sufficient to prevent it from happening. Where this is not possible, owing to advantage having to be taken of suitable rains, and the two crops happen to tassel at much the same time, care should be taken to confine the selection work to the portion of the crop furthest from the other crop, and, if possible, away from the direction from which the prevailing winds blow. Where possible, the field selection should be carried out prior to harvesting and at a time when the ears are ripe enough for picking, but when it is still possible to distinguish between the early and late maturing plants.

Look for Ears of Even Ripeness.

By continually selecting as nearly as possible only ears of even ripeness, the resultant crop will tassel more evenly than if an indiscriminate selection of early and late maturing ears were made and consequently a much better fertilization will occur, the result being well-filled ears.

Where the tasselling extends over too lengthy a period, fertilization, except under unusually favourable conditions, is not as good owing to the fact that the supply of pollen is more limited and many of the plants may have to depend largely on their own supply of pollen for fertilization.

Seed Ripened Prematurely Should be Rejected.

In selecting from early maturing plants, particular care should be taken to see that ripening occurred naturally and was not the result of disease or injury. During the present season, and this applies particularly to some of the coastal districts, many of the crops were more or less affected with maize blight and consequently any badly affected plants will have ripened prematurely and should be carefully avoided. Affected plants are easily distinguished, even when dry, by the peculiar whitened appearance of the leaf. The ears will also be found to be lacking in that firm feel which is typical of a sound healthy ear and the grain will be also more or less pinched and loosely packed.

Insect Injury.

Another common cause of forced ripening is injury by the maize grub, and where this is the cause, it will be found that the grub has bored through or into the shank or core.

Select Seed from Healthy Plants.

Selections should be made only from strong healthy plants with a good root system and from those which are growing in an average stand and not in an isolated or favoured position. A good root system is very important, for a plant with a poorly developed root system cannot withstand drought; it is more easily blown down by the wind and there is also the possibility of the poor development being due to disease.

An ear from a diseased plant will frequently be found to possess a weak, easily shredded shank, and it will also be found that the core at the butt is discoloured and hollow or partly so.

Ears showing any of these signs should be discarded and only those which possess firm shanks which break away cleanly and show a clean healthy pith at the base should be chosen.

Other Important Points.

The height of the ears on the plant is another very important point to be considered. They should be borne at, or slightly below the middle of the plant, for where they are borne high up on the stalk, harvesting is rendered more difficult and the plants will lodge much more readily during wind storms.

Ears with a shank of medium length and thickness which turn down during ripening should be selected in preference to those with a short, thick shank which remain erect. An ear when turned down will shed water more readily and is also less liable to become damaged by birds and insects than those which remain in an upright position, providing of course the husk covering extends well over the tip of the ear.

A good husk covering is very necessary, for it will almost invariably be found that an ear which has the tip protruding is more or less damaged by water or insect attack.

Regarding the number of ears to the plant, it is advisable to select from the plants which bear one good ear and at the most two, providing one of them is of standard size. Otherwise it will be found that the tendency will be to produce several small ears, with the result that the quality of the grain is affected and the cost of harvesting is increased. The points already discussed will show how necessary it is to carry out

the seed selection in the field, if a grower wishes to improve the variety and at the same time retain the desirable characteristics which the variety possesses.

Where this is not practised and the selection work is left until the crop has been picked it will be impossible to tell under what conditions the ears were produced, and many which are produced under most favourable conditions will be selected in preference to others which are only slightly smaller, but which were produced under average or probably adverse conditions. Naturally, those produced under average or adverse conditions would be of much greater value for seed purposes than those produced under favoured conditions.

It is advisable to always select considerably more ears in the field than will actually be required for seed purposes. The final selection should be made in the barn and the ears selected should be of good size, without being coarse, and should also be of uniform type, shape, and colour. They should be cylindrical in shape, except in the case of a few varieties which produce a slightly tapering ear, and should be well filled up to the tip.

The types of dents vary, a few varieties having a "smooth" or "dimple" dent, but the majority of the most popular varieties now grown in this State have a "crease" to a "medium rough" dent. Grain with a "pinch" dent should be avoided, and, although it is usually of good depth, it is almost invariably light and of a soft starchy nature and will never command the price that plump, well-filled maize will. The shape of the grain varies according to the variety; those which produce ears with less than fourteen rows, such as Golden Beauty and Hawkesbury Champion or Golden King, have a slightly round-shouldered, broad grain of medium depth. Those which produce ears with fourteen rows and upwards should have square-shouldered, tightly packed grain with only a very small space between the rows. The grain should be firmly attached and should show little or no movement when pressed with the points of the fingers. Ears with coarse, sappy piths or cores should not be selected, as they dry out slowly and generally show a lower shelling percentage than those with a medium-sized core.

Uniformity is breadth and shape of grain is a very important point, and is one which should be strictly adhered to if the variety type is to be preserved.

The colour of grain differs according to variety, some of the yellow varieties having a bright amber-coloured grain with a rich yellow cap, and others a pale, amber-coloured grain with a light cream-coloured cap.

Whatever colour is being selected, uniformity should be practised and on no account should an ear of a yellow variety, for instance, be selected which shows reddish or white grains. The straightness and evenness of the rows, while being desirable features, are less important than those already discussed, and as long as they are reasonably straight and even and the ears are otherwise desirable they need not be discarded.

The ears should be topped and tailed before shelling, not that the round grains from the tips and butts would not germinate, but because it is impossible to get an even sowing with a planter with seed that lacks uniformity in shape and size.

Before the seed is stored it should be thoroughly dry and quite free from injurious insects.

The quantity of seed maize required for the average farm is not large, and it is quite a simple matter to store the grain and keep it in good condition for the following season's planting. All that is necessary is an airtight container, such as a carbide drum, and, after making certain that the grain is thoroughly dry, it can be placed in this with a small quantity of flaked naphthalene mixed well through it and the lid sealed down. The naphthalene will destroy any moth or insects which may hatch after the grain is placed in the container, and will not affect the germination.

The Irrigation of Tobacco.

By N. A. R. POLLOCK, H.D.A., Senior Instructor in Agriculture.

THE production of bright tobacco leaf is not favoured in districts where growth is wholly dependent on the moisture supplied by irrigation, owing to the adverse effect on leaf quality of the extremely dry atmosphere there prevailing.

In many of the recommended tobacco-growing districts of the State, however, there are times when the application of water will prove of very great benefit if used judicially, either when planting out or later when a check in growth is anticipated through a delayed fall of rain.

Before discussing the crop under irrigation, it is well to consider the effect of the application of water on the soil and its influence on those factors intimately connected with the growth of plants.

Crop Essentials.

For the best growth it is essential that a sufficiency of plant food, soil moisture, air and light should be provided under a suitable soil temperature. It is also essential that there should be no toxic or injurious substances in the soil such as might be added by the application of water carrying deleterious salts, such as sodium carbonate, or sodium chloride, in solution.

As the water available for irrigation in districts suitable for bright tobacco production is remarkably free from such impurities, its use will cause no trouble in the latter direction which therefore need not now be discussed.

Mechanical Effect of Irrigation.

It remains then to consider the mechanical effect of water when applied in quantity to the soil.

When in good tilth a soil is composed of little clusters of soil particles which create a loose, open or crumb structure, thus allowing a ready and deep penetration of roots into the soil, a good aeration and easy entrance of water.

The effect of water standing for some time on the soil, as in furrow irrigation, or when it collects on the surface from extra heavy falls of rain, is to break down these crumbs into their constituent small particles. These tend especially in the heavier soils to pack together and to make the soil relatively impervious.

It will be realised then that irrigation water may have a very marked effect on an essential factor in plant growth, namely, the air

in the soil. When the soil particles are closely packed and a crust or cake forms on the surface, there can only be a very slow exchange between the air of the soil and the atmosphere above. The result of this is that there is insufficient oxygen for proper root development or for the use of those soil organisms that break down organic matter and make plant food available. Further, it may be noted that certain injurious organisms which reduce oxidised compounds to form injurious reduction products thrive in poorly aerated soils. Thus another factor, that of the supply of plant food, is affected. Without the free circulation of air, especially when the soil is saturated with moisture, its temperature is likely to be unduly lowered.

An additional defect in this packing of the soil, unless remedied, is the slow percolation of water in subsequent applications.

It will be abundantly clear from the foregoing that the maintenance of a friable pervious condition of the soil is of major importance when a crop is grown under irrigation. It is an axiom that irrigation and drainage should go hand in hand as without the latter the avoidance of excess in application is not easy.

The maintenance of just the necessary amount of moisture in the soil without interference with the supply of air and light or undue disturbance of the soil temperature should be the objective when applications are made.

Soil Moisture Requirements.

It is calculated as the result of experiments in many countries that the optimum crop growth is made when the soil has 50 to 60 per cent. of its maximum capacity for water satisfied. This is equivalent in an average soil to 2 inches of water per foot of depth. Consequently amounts over that quantity equally with those under it will tend to lessen growth. The amount of water calculated as in the soil when a crop wilts is about 1 inch. This suggests that to bring the soil to its desired moisture content when wilting occurs, an application of 1 inch to each foot in depth is necessary.

An ideal system of irrigation is one that most closely approaches a light shower of rain, when each drop penetrates as it falls without at any time causing complete saturation or allowing water to accumulate on the surface. The expense, however, of installing such a system would probably be prohibitive.

Methods of Watering.

The general method of application for a tobacco crop will be in furrows between the rows of plants which would be grown on hills or ridges.

In application by this method it is advisable to consider the manner in which the water becomes distributed through the soil. Percolation downward and laterally is to be expected, the rapidity of the former and extent of the latter being determined by the looseness of the soil. As a rule percolation downward to at least the depth of the ploughing is much more rapid than that laterally, but it can be expected on most soils with ordinary applications that lateral percolation will allow the moisture to become equally distributed in the soil between furrows and to rise by capillarity in the hills or ridges.

To allow of similar distribution in subsequent application it is evident the soil between hills or ridges should be well broken after each irrigation.

To avoid excess in any one part it is essential that the field should be graded so that the fall would be even throughout the length of the furrows. Implements to secure this will be found in the Buck-scraper, Louver grader, and smoother and leveller, which may be purchased or made on the farm from plans available from the Subdepartment of Irrigation and Water Supply or through the Department of Agriculture.

The length of irrigating furrows will be decided by their fall. With little slope an excess is likely on the first part of long furrows before sufficient water has reached the end. On the other hand too steep a fall will allow of erosion. In general the less the slope the shorter should be the furrow, and the quicker the application.

Damage from Soil Saturation.

The tobacco crop is perhaps more subject than others to damage from soil saturation since excess of moisture inhibits root extension and invites the attack of particular fungi, the effects of which with following bacteria are commonly described as root rots.

On deep sandy soils or where a good drainage is provided, less damage from excessive applications can be anticipated, but here the supply of water beyond a sufficiency can be regarded at the least as a waste of time and money. On soils possessing a somewhat retentive subsoil, or where the particles are so small as to render under drainage very slow, soil saturation is an ever present danger.

The evil effect of saturation on such soils, as previously mentioned, is due not only to the excess of moisture in itself but to the reduction of soil temperature and its action in preventing the ingress of air and light to the soil, all of which factors contribute so materially to normal plant growth.

When to Cultivate.

Cultivation should, as soon as practicable, follow the application of water to the soil not only to allow of its aeration but to check evaporation. The number of cultivations between applications will be regulated by the soil texture, the aim being to secure a loose but not unduly rough surface. Particularly is this cultivation necessary on fine-textured soils carrying a proportion of silt and clay, where a crust forms after rain.

Hilling the Crop.

In tobacco culture it is the general practice arising from years of experience to grow the plants on hills or ridges, and especially is this considered advisable when the crop is irrigated.

The land being well ploughed and the soil brought to a satisfactory tilth, it is advised to throw up hills in the following manner at the desired intervals. A full furrow is turned and when the fertilizer is distributed at the back of the sod so turned another sod from a furrow ploughed in the reverse direction is thrown against it to form a ridge similar to the formation of a crown when a field is cross ploughed. There will thus be two furrows with the ridge between.

Planting Points.

If the soil is not sufficiently moist to allow of planting, a good irrigation should be given to one of the furrows some little time, preferably the day before, the plants are to be set out. This will allow time

for the water to percolate laterally and rise by capillarity in the hill to permit of the roots of the plants, set in the centre line of the hill, being placed in moist soil while that of the surface remains loose and friable. If there has been insufficient rain prior to planting to supply sufficient moisture over the whole field, an application of water in the second furrow is suggested, immediately after planting is completed. It is not desirable to apply water in both furrows prior to planting as the planter will walk in one when setting the plants out.

As soon as practicable, from two to four days usually, after the application of water a deep cultivation should be given between the hills, special attention being given to break the cake or crust formed and to fill in the furrows which carried the water. A further cultivation should follow a week later when the soil should be rendered loose and friable, both on the ridges and between. Subsequent applications of water given in furrows midway between rows of plants will be governed by the rainfall, if any, the porosity of the soil, and the behaviour of the plants which will show a wilting of the leaves immediately the supply is below requirements. It should be noted that the finer the particles and the greater the content of humus and decaying organic matter in the soil, the more is its capacity for the absorption of moisture increased. Deep, slow-draining soils or light soils with a somewhat retentive subsoil will require lighter applications than deep porous sands.

Naturally as the plants develop more and more leaves, the demand on the soil moisture will be increased, suggesting that applications should be heavier or at less frequent intervals.

Great care should be exercised in applying water to the tobacco crop to avoid soil saturation. Irrigation, alternately, between odd and evenly numbered rows, will tend to obviate this danger, as the excess in one can be expected to percolate to the other. It is considered when proper attention is given to cultivation, four or not more than five irrigations should be sufficient to grow the crop. If rain falls at intervals the number will be lessened. After topping a final heavy irrigation should be given without subsequent cultivation. This should be sufficient to carry the crop to the end of the picking.

Cultivation After Irrigation.

Cultivation of the soil after irrigation is imperative to secure good results. Not only does the breaking and loosening of the soil permit a desirable aeration, but the creation of a loose surface or dust mulch retards evaporation of the moisture brought towards the surface by capillary action. The growth of weeds which rob the soil of much moisture is also checked.

Where insufficient cultivation is given more frequent irrigations are necessary. Such a practice is not economical as the cost of production is increased and the value of the product almost certain to be reduced.

When water is applied it is not advisable to use the cultivator until two or more days thereafter, or until the surface is sufficiently dry to allow the passage of a horse without sinking and the soil to break without adhering to the implement. The first cultivation after the plants are set out should be deep from hill to hill without, however, disturbing the soil of the latter, which should be lightly broken with a

hoe or rake if a crust has formed. Disturbance of the soil in the hill to any depth at this stage is apt to interfere with the strike of plants. A second cultivation should be given a week after the first to further fine the soil and to check any weed growth.

If rain does not fall and no weed growth appears, it is not necessary to cultivate again until after further irrigation.

The second and subsequent irrigations should be in furrows midway between the rows of plants.

After about three weeks the plants will have all struck and made growth so that disturbance of the soil on the outside of the hills with the cultivator will be beneficial in that lateral percolation will be assisted.

In the next cultivation some of the soil should be drawn to the hills to enlarge them.

So, after each application of water the immediate cultivation should be to break up the soil and that following to fine the soil and to build up the hills until, at the final irrigation after topping, the plants are growing on "hogbacks" or round-topped ridges with a furrow between.

The depth of cultivation should be deep, 3 or 4 inches in the centre between rows, becoming shallower to around 2 inches as the plants are approached. After the final irrigation when the plants are topped, further cultivation should not be attempted.

At this stage the leaves will be approaching maturity when the lack of aeration of the soil will assist in the yellowing or ripening of the leaf.

As the plants grow the leaves will project towards the centre of the rows to such an extent that the use of the cultivator might be expected to cause damage.

In early morning the leaves will be brittle but after a few hours of sunshine they will become much more supple. If a short spreader is used on the trace chains just sufficient to keep them from chafing the horse's legs, cultivations can be used from about 10 a.m. to sunset without damage to plants until the flower heads form.

During growth the soil immediately around and between plants should be kept loose and open for 1 to 2 inches in depth by the use of hoe or rake. Priming should receive careful attention, leaves showing leaf-miner being carried off and burnt immediately. Destruction of the insect in the larval stage by this means will lower or prevent future infestation.

The objective in setting out the plants on hills in the first place is to promote drainage and to prevent the saturation of the soil, particularly at the base of the plant. The further building up of the hills not only assists in that direction but adds more plant food to the feeding roots which run close to the surface and encourages the deeper lateral roots to spread further and so more readily secure the moisture demanded.

A properly cultivated plant, whether grown by irrigation or otherwise, will not only exhibit a better root structure and be more stable, but will produce leaf of better quality.

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Fat Lamb Raising.

By JAS. CAREW, Senior Instructor in Sheep and Wool.*

FAT lamb raising, as combined with agriculture, is an enterprise in which every farmer who has sufficient suitable land available should engage. The holding should contain sufficient good agricultural land to produce the fattening crops necessary for that purpose, and also to provide some reserves during good years in the form of hay ensilage and grain. To back this up there should be a sufficient area of good grazing country to run the flock on at all times, other than when mothering the lambs. Some localities possess distinct advantages for lamb raising, such as a combination of the desired type of country in a suitable rainfall region, congenial climatic conditions, and convenience of situation in respect of railway facilities, markets or abattoirs. Many parts of the Darling Downs, West Moreton, and the Burnett are, therefore, very suitable for an extension of the industry.

Having the land, the next thing is to so improve it that it can be worked conveniently to the best advantage. Fences should be so arranged as to allow for changing or spelling paddocks, with suitable provision for watering. I do not advocate the changing over from an established industry to fat lamb raising, but I do think that there is room for a vast extension without unduly interfering with progress in other branches of primary production. Every farm should be as self-contained as possible, and without sheep many farmers are not getting the best out of their property. The chief reasons why more farmers are not keeping sheep are, firstly, that sufficient provision is not made for running them properly; secondly, that the breed or type first introduced is not suitable to the country or conditions; thirdly, that the health of the sheep is not sufficiently safeguarded, or that the country is not suitable to maintain health; and fourthly, by depredations by dogs.

The Foundation of the Farmer's Flock.

For fat lamb production a suitable breeding flock is necessary, and herein many different opinions prevail. For best results in production, a good type of ewe of the English long wool—half-bred Merino cross takes pride of place, and should be selected according to the cross most suitable for the district. For the heavier rainfall regions, I consider that the nearer they are to the Romney Marsh the better, while on the more elevated areas and in the lesser rainfall belt such as the Darling Downs, I give preference to the Border Leicester cross in the breeding flock.

The Border Leicesters carry a large carcass, are clean on the head and points, quick to mature, good milk producers, handy to handle, and produce a fair weight of good quality crossbred wool, for which there is usually a ready sale. They cross successfully with the different Downs breeds, the progeny being good growers and fatten at an early age, their chief disadvantage being that they do not mate successfully

* In a radio broadcast from Station 4QG.

during the spring or early summer. Like the other English long-wool breeds they mate best in the autumn.

It is difficult in Queensland to secure a good line of crossbred ewes to form a breeding flock, therefore they will need to be bred up. This can be accomplished by securing the desired number of western bred Merino ewes of the plain, large-framed type. These will be all the better if they are 6-tooths, which have previously reared a lamb. By mating these ewes with the Romney Marsh or Border Leicester rams, according to the location, the ewe progeny can be retained for breeding purposes. After sufficient lambs are reared to form the breeding flock, and while the ewes are still capable of being fattened they should be disposed of as fats and not allowed to become broken mouthed and decrepit. A sufficient number of Merino ewes should be kept or introduced to make up wastage. After the crossbreds have produced about five lambs they, in turn, should be fattened off, at which time they should command a good price as they possess a good carcass for the butcher.

The Lincoln and their crosses are generally more robust than the Border Leicesters, and will last longer as breeders, but neither they nor the English Leicester possess any particular advantage over the Romney Marsh or Border Leicester to favour their claims in producing a farmer's flock.

Purebred Merino ewes have special claims as a farmer's breeding flock, owing to their adaptability of mating successfully both in autumn and spring, or early summer. It is usually an easy matter to purchase a flock of suitable age and type, which will produce a valuable fleece. Their chief disadvantages are that they are rather scanty milk producers, they do not lend themselves to close farming conditions, and are careless as mothers. The English long wool Merino cross, on the other hand, can be worked conveniently; they are large in frame, strong in constitution, and are good milk producers. All these qualities are important in securing a quick development in the young lambs and assist in getting them off at the earliest possible age.

Although the ewe flock is very important, they do not exert the same influence over the progeny as the sires. It is owing to this influence that we must pay particular attention to both the breed and characteristics of the rams that are introduced.

Market Requirements.

The demand for lambs overseas now is for the young, succulent, plump and of not more than 33 lb. dressed weight, carcass showing plenty of bloom. To secure this type the Downs breeds are likely to produce most of these characteristics, the Southdown and Dorset Horns probably appearing to best advantage. This does not infer that other types of dressed carcasses fall away to any extent in price per lb., such as a prime 38-lb. Border Leicester, which can be secured at or before five months. Whatever breed of ram is used, they should be pure, true to type, and kept healthy.

Even when breeding on proper lines, the only way to secure and place prime lambs on the market is to give them a good start and then

keep them going without a check to the time of trucking. The natural grasses are seldom good enough for the length of time needed to top them off, therefore success in a general way can only be looked for in co-operation with crop production. This indicates that those engaging in fat lamb raising must, be to some extent, agriculturists as well as having a knowledge of sheep husbandry.

Flock Management.

Crops must be timed to come in to suit the fattening period. Those for winter and spring feeding may include oats, wheat, barley, rape, and turnips; while the panicums, millet, and Sudan grass, may be selected for summer and autumn feeding. If lucerne can be grown successfully, it should form the chief supply, as it is one of the best and most economic fodders, but it must have other pastures associated with it as a change.

If the ewes are moved on to good feed soon after lambing, their milk supply will increase, and if marked at from two to three weeks they will not suffer much of a setback, and if sold right off the mother they should carry plenty bloom. At this age they cannot be expected to stand up to hardship and starvation, therefore quick transport, careful handling, and immediate treatment at the works are important factors in avoiding loss and maintaining an attractive carcass appearance. Evenness of type is another point of importance, and for that reason too many breeds or crosses are not desirable.

Lamb Raising Scheme.

Recently the Department of Agriculture and Stock introduced a Fat Lamb Raising Scheme under which about eighty rams of the Border Leicester, Southdown, and Dorset Horn breeds were distributed among over thirty growers, with the intention of encouraging fat lamb production; and, at the same time, securing data likely to be helpful in determining the most suitable breeds and types to produce.

The conditions under which these rams are made available to farmers are that they have free use of them during the time the scheme is in operation, but that the rams remain the property of the Department. The farmer undertakes to care for and have them shorn, and to co-operate with the Department in recording all necessary details. The whole of the progeny is the property of the producer, but a percentage of them are to be consigned to the Brisbane Abattoir, to be treated there and reported on for the purpose of the scheme. Further, the Queensland Meat Industry Board has undertaken to obtain a report from England in regard to their condition and quality on arrival there.

Besides the ordinary method of selling through the yards and the buyer having the lambs treated at the abattoirs for export, they may also be treated on the owner's account for export. In this connection, the following particulars should be observed:—

1. Before sending lamb to the abattoir, producers must book killing space, stating number to be treated and suggesting the most suitable date. The Meat Board will then allot space and notify the producer upon which day the lambs should arrive at Cannon Hill.

2. Producers booking killing space will be expected to utilise it, or, if not required, to notify the Board as long as possible before the date booked for killing.

3. Lamb must be consigned to the Board and full particulars of the consignment furnished the Board.

4. The Board will take delivery of the stock at Cannon Hill.

5. The Board will slaughter, weigh, grade, freeze, and wrap carcasses and, subject to space being available, will provide up to 28 days' free storage at a consolidated rate of $\frac{3}{4}$d. per lb.

6. For the convenience of producers, the Board will credit the producers with the value of fat, kidneys, tongues, livers and rejects, at market rates and, if desired, will dispose of the skins on the producers' account to the best advantage.

7. The consolidated rate of $\frac{3}{4}$d. per lb. includes loading aboard steamer at the abattoir wharf. The Board will arrange the shipment and will prepare documents, which the Board will hand to the producers' bankers, or other agents through whose agency they wish the meat disposed of.

8. With regard to the minimum of lamb the Board will treat on owner's account for any one client, it would be advisable from the standpoint of economy to fix a minimum of 250 head, and this would not preclude owners of smaller lots in any neighbourhood pooling their lamb to make the required amount.

9. Lamb will be graded as to quality and weight in accordance with export standards and, unless otherwise arranged, will be branded with the Board's registered brand, and each parcel shipped will be specially marked according to ownership.

10. Insurance of meat while in store awaiting shipment, while in transit, and for a certain period at destination will be for owner's expenses.

Insurance to the United Kingdom and Continent—Rate 30s. 6d. plus 25$\frac{1}{2}$ per cent. exchange, equal net 38s. 4d. per cent. This covers from the time the carcasses are passed into the cooling and/or freezing chambers of the abattoir at Brisbane, and continues on board the vessel and in cold stores in the United Kingdom for a period not exceeding sixty days from arrival at destination.

11. Shipping charges.—Freight on mutton 1d. per lb. plus 18 per cent. exchange—1.0915d. per lb.; freight on lamb 1$\frac{1}{4}$d. per lb. less 10 per cent. plus 18 per cent. exchange—1.3275d. per lb.; harbour dues 2s. per ton; bill of lading 2s. 8d.

London Charges.—Port rate, landing warehousing, cartage, pitching and tolls, and including selling commission at 2 per cent. approximate, 0.362d. per lb.

Stock Licks for Sheep.

J. L. HODGE, Instructor in Sheep and Wool.*

FIRST let it be admitted that in certain cases the need for a sheep lick exists, and that its use is economical if scientifically applied. The need for it should first of all be detected in an otherwise unaccountable falling-off in the condition of the flocks, with a generally unthrifty appearance; apart altogether, of course, from drought and parasites.

The ingredients to be used should be determined scientifically by proved deficiencies in the soils, pastures, and waters to which sheep have access.

This may be determined by an analysis of all three. The prescription should then contain ingredients to make good the deficiencies. The greatest proved deficiency in most Australian pastures is in a lack of phosphates. For this reason, the basis of most sheep licks should contain a material to make this good. The days when salt only was recommended as a lick in season and out of season are long since passed, and science has come to the help of the grazier and indicated what ingredients should be used under a certain set of circumstances.

One frequently hears of the excellence of a lick in a certain district and under certain conditions, but it does not follow that because it has proved beneficial to one flock in the district mentioned that the lick is going to do the same good work somewhere else, and under an entirely different set of conditions. The ingredients used may have been perfectly right in the first instance, and more or less useless in the other case.

Observe the Condition of the Flock.

The main thing to note is the condition of the flock. Carefully observe any falling-off in condition, not attributable to seasonal circumstances or the attacks of internal parasites, and quickly ascertain the cause. In nearly all cases, it will be found that there is some mineral deficiency, either in the grasses or waters to which sheep have access. The ingredients in the lick, scientifically prescribed, should supply this deficiency.

When sheep are drinking from an artificial water supply, such as bores or wells, analysis is an easy matter, but when the same flock has access to other waters as well, such as rivers, lagoons, and surface tanks, the analysis becomes more complicated. It is necessary, however, to ascertain the quantity of salt in the waters on account of the fact that the greater salt content shown the less of that ingredient would be prescribed in the lick. In the case of waters from wells or bores, it is quite possible that no salt at all would be used.

Lick Recommended.

On the other hand, analysis may prove the entire absence of salt. In this case the addition of the required quantity of salt may form, in weight, the greatest bulk in the lick. Under drought conditions, it is often beneficial to add a protein such as linseed meal, cotton-seed meal, or maize meal to the lick. Under the heading of drought conditions

* In a broadcast from Radio Station 4QG.

comes hungry winter feeding when the pastures are dry and hard. A lick we recommend for such conditions is as follows:—

	Parts.
Nauru phosphate finely ground, or sterilized bonemeal	40
Salt (butcher's quality)	40
Sulphate of iron	4
Epsom salts	4
Linseed, cotton, or maize meal	12

Sterilized bonemeal is to be perferred to Nauru phosphate on account of the fact that it contains not only phosphoric acid which is common to both, but also a protein. However, it is more expensive and the supply is not sufficient to meet the demand.

We would advise graziers to have on hand a supply of the ingredients mentioned, with the object of mixing the lick on the property. Once the object for which the ingredients are prescribed is understood, it should be an easy matter for the sheep man to vary the quantities as conditions for change make their appearance.

The Nauru phosphate or sterilized bonemeal is a necessity, and should always form the basis of the lick, but the salt may be greatly reduced or entirely omitted if the water to which sheep have access is salty. The sulphate of iron is a tonic, and the proportion mentioned may not always be necessary, and the epsom salts, being a laxative, may be either increased for hard scrub or winter feeding or decreased as circumstances dictate.

Taken on broad lines, and under adverse conditions when a lick may be relied upon to do most good to the flocks, the ingredients should consist of phosphates, a protein, a laxative, and a tonic, with the addition of salt, the quantity of which should be governed by the special conditions obtaining at the time.

A Lick Feeder.

The practice of feeding a lick to sheep in open troughs is not to be encouraged; it is wasteful. Besides the risk of loss by rain, the flocks foul the mixture, making it eventually unfit for consumption.

The lick feeder recommended by the Department consists of a V-shaped trough, with a hinged and covered top. There is an aperture at the bottom of the trough which automatically releases the lick. A lick board sufficiently broad for the purposes, is attached to the stand about an inch and a-half below the opening, and at a serviceable height from the ground. A beaded edge is supplied to save unnecessary waste.

Legislation these days makes it compulsory for proprietary vendors to register their licks with the Department of Agriculture and Stock, and to attach a label to each package setting out the contents. Many proprietary licks are on offer. Some are good, some not so good, and some indifferent. The flock master proposing to purchase would be well advised to get the opinion of this Department as to the suitability for his country and particular circumstances. During a good season, the necessity for a lick decreases. This is accounted for by the fact that the pastures themselves are supplying the sheep grazed on them with the necessary minerals and food materials. Proteins are especially plentiful with the early bite or young grass growth. Hence the presence of the materials usually supplied in the lick when the season is adverse.

Beware of Salt Poisoning.

Beware of over-feeding salt to ewes in lamb. There appears to be no doubt that a too-plentiful supply of salt has a good deal to do with what is called lambing sickness, or twin disease, for want of a better name. After half the period of gestation has passed, ewes are particularly susceptible to salt poisoning. It is, therefore, recommended that a great proportion of the salt in a lick should be taken out in the case of the ewes as mentioned.

The lick, as prescribed and containing the salt, may be fed to the dry portion of the flock with safety and advantage.

It should be the object of the flock owner to have his sheep consume from 2 oz. to 3 oz. of a prescribed suitable lick per head per week.

Ewes rearing lambs require more than dry sheep. Weaners and young sheep, too, could with advantage do with more lick than is consumed by the dry portion of the flock.

It is not sufficient that sheep should be placed on grass irrespective of what that grass contains in the matter of proteins and phosphates. It may be a case of malnutrition or practical starvation in the midst of apparent plenty. It is what those grasses contain in the way of tissue, bone, and body-builders which is so important.

Deficiency in minerals and proteins is particularly noticeable on natural grasses during the winter months, even if apparently there is plenty of feed.

It is not economical or necessary that a lick should be supplied all the year round irrespective of seasonal conditions. After good pastoral rains, and when the young pasture is at its highest feeding value, the sheep are naturally supplied with the ingredients which should be in a lick to combat adverse seasonal conditions.

Rule-of-Thumb Methods no Longer Apply.

The days are fast passing when rule-of-thumb methods apply to the care and husbandry of sheep. Imagine what the addition of even half-a-pound of wool per head, brought about by the knowledge of what to do and the care in doing it would mean to both the individual grazier and the State in actual money value!

Graziers sometimes do not detect early enough a loss of condition and bloom in flocks brought about by conditions other than parasites or drought. There is a cause for this loss in condition, and it should be the care of every flock master to ascertain that cause without delay. It will be found in most cases that there is some deficiency in the feed, brought about by the absence of those minerals so necessary to the general health of the sheep.

This deficiency should be detected, and the ingredients required made available in the lick.

It is urged, therefore, that graziers should make themselves fully conversant with the properties of the ingredients recommended in a lick so that they may vary the quantities in accordance with seasonal conditions, to the wellbeing of their flocks and the benefit of their own pockets.

Pig Feeding.

By L. A. DOWNEY, H.D.A., Instructor in Pig Raising.

PART II.

THE most important point to watch in pig feeding is the condition of the stock, for the pork and bacon trades require pigs in a finished, fleshy condition, but not too thin or too fat. The illustrations herein will indicate approximately the right and the wrong condition for porkers or baconers.

It has already been mentioned that pigs require variety in their rations, that at least a portion of their food should be concentrates, that they require both nitrogenous and carbonaceous foods, and that many other factors must be considered in the selection of pig foods.

In the following pages the more common pig foods have been grouped as follows:—(1) Grains and Mill Offals; (2) Protein-rich Concentrates; (3) Dairy By-products; (4) Pasture and Forage Crops; (5) Root Crops; and (6) Miscellaneous Foods. The notes are intended to assist pig raisers in determining the value of each food when used in combination with other foods.

NOTES ON FOODS COMMONLY USED BY QUEENSLAND PIG RAISERS.

(1) Grains and Mill Offals.

Maize.—Maize has a large proportion of digestible nutriments. This is accounted for by its relative lack of moisture and indigestible fibre. The high percentage of carbohydrates brings maize under the class of carbonaceous or fat and heat-forming foods, and as its nutritive ratio is too wide for pigs, maize must be fed in combination with nitrogenous foods. Also, as maize is lacking fibre the addition of some roughage improves the ration.

Maize is also low in mineral content and this lack of sufficient protein and minerals makes it a very unsatisfactory food for pigs unless it is balanced with other foods rich in proteins and minerals. The improper use of maize in unbalanced rations has earned for it a reputation for producing a soft and fat carcass, but it has been amply demonstrated that, when used in complete and balanced rations, maize is one of our best pork-producing foods and its use can be continued with confidence provided its shortcomings are understood.

The quantity of maize used in pig feeding is usually governed by its market value and the price of pork. Approximately 5 to 6 lb. of maize (or its equivalent, as it is not wise to feed maize alone), will produce one pound of dressed pork in good young pigs, or, each bushel of maize should return ten pounds of pork. This knowledge enables the pig raiser to calculate the value of maize as grain and as pork. When maize is worth 2s. 6d. per bushel as grain and dressed pork is worth 5d. per lb. each bushel of maize should be worth 5d. $\times$ 10 = 4s. 2d. as pork. In such a case it would pay the pig raiser to feed all the available maize to good pigs with just sufficient protein-rich foods to balance

the ration. When the value of a bushel of maize is more than the value of 10 lb. of dressed pork, maize should be used as sparingly as possible, and some cheaper carbonaceous food used in its place where practicable.

Maize is one of the most palatable foods for pigs and may be fed on the cob, shelled, crushed or ground, and at times it is harvested by the pigs and eaten off the stalk.

Although American experiments have demonstrated that the increased feeding value of ground maize does not compensate for the expense of grinding, observation here shows that when pigs do not thoroughly chew the whole grain, there is a considerable waste in the excreta, but usually when pigs have been accustomed to feeding on whole maize, either on the cob or shelled, there is practically no waste. If the palatability can be increased by grinding or soaking, then there may be some justification for preparing the grain in this manner.

PLATE 117

These pigs are not in a finished condition, and require more feeding to prepare them for slaughter either as porkers or baconers.

Wheat.—Wheat is much better supplied with protein than is maize, and the nutritive ratio is much narrower though it is still a little too wide for young pigs. In feeding value, wheat closely resembles maize and it is nearly as palatable as maize. The quality of meat produced from wheat is very satisfactory. Wheat is less frequently used for stock feeding on account of its high average value for human food. Being a small, hard grain, wheat gives much better results if ground before feeding to pigs. Shrivelled wheat usually has a higher protein content than plump grain.

When costly protein-rich foods have to be purchased to balance the grain in the ration, the high protein content is a point in favour of wheat as against maize.

Barley.—Barley is another of the useful grains for the pig's diet; although slightly below the feeding value of maize and wheat, it is palatable and has a reputation for producing an excellent quality meat. Barley requires grinding before feeding to pigs. The nutritive ratio of barley is nearly the same as maize, but its total digestible nutrients are less than those of maize. Its use can be recommended with confidence provided its market value is in accordance with the price of pork.

Sorghum.—Grain sorghums are a much neglected pig food, ranking only a little behind maize in feeding value but seldom used. The hardiness of this crop and its ability to produce grain when maize would fail, deserves the consideration of the pig farmer who would provide a succession of crops for a regular supply of pig feed throughout the year.

Like the other small grains, sorghum grain should be ground before feeding to pigs to get the greatest feeding value, but as the grain can be fed on the heads or even from the standing crop, preparation by grinding will probably not be favoured by most farmers.

Pollard.—Pollard, which is a by-product from the milling of wheat, has its place on the pig farm being very palatable, and usually available at a price to make it worth feeding to pigs.

Pollard contains a much larger percentage of protein than maize, but still it can hardly be classed as a nitrogenous concentrate. Its use in the ration to replace a portion of the grain is often economical, but it must be remembered that pollard is always a purchased food, whereas the grains can be produced on the farm.

A little pollard is very useful in the ration of young pigs immediately before and after weaning. Pollard, although fairly rich in protein is not sufficient to balance up rations of carbonaceous foods as are separated milk or meat meal. Experimental feeding has shown that excessive feeding on pollard produces a soft carcass in pigs, but when pollard is merely used as a supplement to grain, there is little risk of this trouble occurring.

Bran.—Another mill offal, is not such a good food for young pigs as pollard, its fibre content being higher, and its fat and carbohydrates being lower than those of pollard. Bran, however, is a laxative and for this reason it has its use for brood sows about farrowing time, and a bran mash is often given to pigs which are in ill-health, and need some food which will stimulate the bowels.

(2) Protein Rich Concentrates.

Meat Meal.—Meat Meal, which is sold under various trade names, is a by-product from meatworks and abattoirs that should become one of the most valuable foods to the Australian pig farmer. It is a nitrogenous concentrate containing a very high percentage of digestible protein and can be put to excellent use in balancing some of the common carbonaceous and bulky foods.

The Australian pig raiser relies to a great extent upon separated milk for his supply of nitrogenous food to balance the grains, &c., and on account of our climatic conditions the supply of milk products is very irregular, and in most years there is a period when the supply is too low to maintain a full supply of pigs; it is on occasions such as these

when meat meal can be put to good use as a substitute for milk products, thus keeping up a regular supply of pigs throughout the year.

Being a highly-concentrated food as well as being rich in protein, meat meal is a valuable addition to a ration containing a large proportion of roughage. The composition of meat meal varies somewhat—particularly the protein content. As some brands of meat meal contain a proportion of bone, their mineral content is comparatively high. Meat meal is made from waste meat which is free from disease, and is cooked under steam pressure and then dried and ground to a fine meal. It is therefore free of disease-producing organisms and can be fed to stock with safety.

PLATE 148.

These pigs are long and lean, but they appear to be sufficiently finished to dress well.

Pigs can be satisfactorily grown on grain and meat meal without the use of milk when each pig receives ½ lb. of meat meal daily from weaning to baconer stage and as much grain as it requires, which will be about 4 lb. for each 100 lb. live weight. Feeding the fixed amount of meat meal right through and just increasing the grain, automatically widens the nutritive ratio as required.

When pigs have access to protein-rich pasture such as lucerne, the meat meal allowance may be reduced to ¼ lb. daily.

Meat meal costs approximately £10 per ton (the price varies very little). While this price may seem high, when it is remembered that meat meal is very rich in protein and only a very small amount (about 4 oz. to 8 oz. daily per pig) is required to balance the grain in the ration, it will be realised that its use at the right time is economical.

When dealing with maize it was mentioned that that grain was low in protein and minerals, therefore, the special value of meat meal, which is rich in these two nutrients, lies in its suitability for balancing a ration containing maize.

Meat Meal may be fed either wet or dry; when fed wet care should be taken so that there is no residue in the trough to putrify and become offensive in odour and dangerous to the pig. It is a palatable food and is relished by both young and old pigs.

American experiments have demonstrated that for balancing grains a supplementary mixture of two parts of meat meal, one part of linseed meal, and one part of lucerne chaff or meal by weight, is superior to meat meal alone.

Linseed Oil Meal.—Linseed Oil Meal is a protein-rich concentrate which can be used in a similar manner to meat meal. It contains less protein than meat meal, but nevertheless it is a highly nutritious food and has a laxative action on the animal, and therefore it is a valuable addition to the ration when an animal is inclined to become costive.

When used as the only protein-rich supplement to grain, linseed meal does not give such good results as when it is used in combination with supplements such as separated milk, buttermilk, or meat meal.

On account of its laxative action the addition of linseed meal to the ration of sows at farrowing time is a wise practice. The fairly high percentage of oil in this food makes it suitable for feeding to stock which are being prepared for show, giving them a glossy coat. Oily foods should be fed with care as their excessive use tends to produce a soft, oily carcass.

Cottonseed Meal.—This by-product of the cotton seed is a nitrogenous concentrate with a very narrow nutritive ratio. The use of cottonseed meal for pig feeding has been limited because in some cases it has been found to produce poisoning when fed in a fairly large proportion over a lengthy period, although recent experiments, both here and in other countries, indicate that at least half the protein supplement of a ration may consist of cottonseed meal provided it is fed in conjunction with meat meal and mineral matter.

(3) Dairy By-products.

Separated Milk.—Although strictly speaking a nitrogenous supplement for carbonaceous foods such as grains, separated milk is used in Australia very often as the basis of the ration, or as the whole ration, and to a large extent the supply of prime baconers and porkers is dependent on the supply of separated milk.

Separated milk contains no fibre, but about 90 per cent. of water. It is one of the most palatable and nutritious foods for pigs and is unsurpassed as a nitrogenous supplement, being even a little superior to meat meal as a sole supplement to grain. Pigs of all ages relish separated milk, and being rich in minerals, it is particularly valuable for growing pigs and breeding stock. Being produced on most farms where pigs are raised, separated milk will be the cheapest nitrogenous food for pigs, and when there is ample supply available there is really no need to purchase other nitrogenous concentrates to balance up the grains and other carbonaceous foods.

The high water content and the narrow nutritive ratio of separated milk make it unsuitable as a sole diet, and it is best fed in combination with carbonaceous concentrates such as grain and fibrous foods such as pasture. The amount of separated milk required to balance maize in the pig's ration depends on the age of the pig which determines the nutritive ratio required; for example—the younger the pig the narrower the ratio required as a larger proportion of protein is required for growth in the earlier stages of life than when the animal is approaching

maturity and wants more nutrients for producing energy, heat, and fat. If young pigs receive a minimum of three-quarters of a gallon of separated milk per head daily from weaning to baconer stage, they will be receiving sufficient protein from the milk to balance all the grain they can eat. By feeding a constant amount of milk—three-quarters of a gallon daily—and increasing the grain as the pig grows, the correct balance of proteins and carbohydrates is maintained. When just sufficient separated milk is used to balance the ration, the greatest value is being gained from the milk, and the feeding of greater quantities results in a loss of nitrogen from the protein of the milk (only the non-nitrogenous portion of the protein being used to make fat) but there are occasions when milk is available much more cheaply than carbonaceous foods and then it may be more economical to use larger quantities of separated milk. On most Australian dairy farms the separated milk supply is so irregular that excessive quantities have often to be given to pigs in order to dispose of it, irrespective of its feeding value.

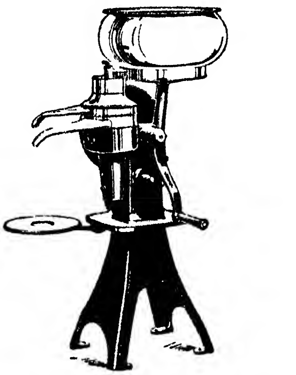
PLATE 149.

It is apparent that these pigs have been carried on until they are slightly too fat to give lean, fleshy carcasses. They should have been marketed at lighter weights or given a more limited ration.

Separated milk may be fed fresh or soured. When it is held in vats to sour and thicken, care should be taken not to allow it to putrefy by holding in filthy containers or by holding for too long a period. The ultimate gain from using soured milk is very little if any, and if the milk is fed fresh after the froth has been removed, quite satisfactory results will be obtained. If large amounts of froth form in the pig trough, the pigs may suffer from a form of digestive disorder (wind) which may end disastrously.

Milk, besides being an excellent food for animals, is an excellent medium for the growth of bacteria, hence care should be taken to have the milk free of disease-producing organisms. Milk and its products which come from a cow suffering from tuberculosis, are a common cause of infection in pigs which receive this milk in a raw state. The milk from one tubercular cow may infect all the milk with which it is mixed, and so pigs drinking any of this milk in an uncooked state would be liable to infection.

Practical Equipment for the Dairy Farmer



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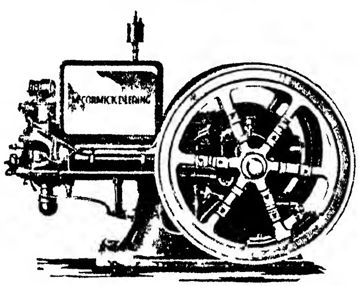

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Unless milk products come from cows that are certified as tubercle-free by a competent person, it is advisable to pasteurise or scald the milk before feeding it to pigs. This is recommended because it is well known that the tubercle germ is destroyed if held at a temperature of 155 deg. Fahr. for twenty minutes or at 180 deg. Fahr. for five minutes. Therefore, all doubtful milk should be heated to these temeperatures as a safeguard against infection of pigs. Heating milk to these temperatures is a fairly difficult problem on the average farm, but there are heating appliances manufactured for this purpose and some farmers are using same with satisfaction.

Buttermilk.—Buttermilk, which is the residue from the cream during the process of buttermaking, is almost identical in composition and feeding value to separated milk, but the buttermilk supplied by butter factories to pig raisers is usually more or less diluted with wash water from the churns, and, of course, its feeding value is reduced according to the amount of water added.

In Queensland the buttermilk from factories is disposed of in varying ways; in the majority of cases a contract for a period of several years is entered into by a farmer to take delivery of the buttermilk and sometimes wash water, from the factory, and the price is calculated either at so much per 1,000 gallons of buttermilk, or at a certain price per annum. The buttermilk is either conveyed through pipes or carted to the pig farm, which should be situated fairly convenient to the factory. At other places the buttermilk is sold to a number of the factory's suppliers at so much per gallon, and it is carted away by the purchaser. Prices paid for buttermilk vary considerably, but the average price is about 10s. to 12s. per 1,000 gallons of buttermilk. At this price, buttermilk would appear to be a cheap food, but when one considers the cost of carting the milk or maintaining a pipeline of about a mile from the factory to the farm, it will be realised that there is more than the actual purchase price in its total cost.

The troublesome feature about buttermilk taken by contract from a factory is the change of seasonal conditions which causes very rapid fluctuation in the buttermilk supply, and as the pig farmer has to keep sufficient stock on hand to consume all the buttermilk that will come in the summer flush period, it will be realised that he cannot at all times feed just sufficient buttermilk to balance the ration, and as pointed out in the notes on separated milk, when more milk is fed than sufficient to balance the ration, the value of the milk is reduced considerably.

Bearing in mind the relatively low cost of buttermilk, the feeder must make the most use of it, as it is doubtful if he can supply any other food at such a low cost, but at the same time, buttermilk, and particularly when it is diluted with water, does not contain sufficient dry matter and has too narrow a nutritive ratio to produce the best results in the pigs, and, therefore, it is best fed in combination with concentrates and forage crops or lucerne hay; but the amounts of these other foods to be fed with the milk must depend on their cost and on the price of pigs.

Buttermilk, like separated milk, may carry the tubercle bacillus and be a source of danger to pigs unless the cream or the buttermilk has been pasteurised. In butter factories pasteurising is done before the cream is put into the butter churns; provided this is carried out

efficiently, that is, if the cream is held at a sufficiently high temperature for a sufficient length of time, there should be no risk of the buttermilk causing infection in the pigs.

Whey.—Although whey is sometimes classed with separated milk and buttermilk as a stock food, it is really in a class of its own. During the process of cheese manufacture, of which whey is the by-product, a proportion of the protein in the form of casein is removed in the cheese, leaving the whey comparatively low in protein content.

With a nutritive ratio 1:9 whey cannot be called a protein-rich food, but, nevertheless, it has its place in cheese-making districts, and is a very valuable adjunct to rations of gain and forage crops provided some nitrogenous concentrate is used to bring up the protein content of the ration. Meat meal in small quantities is useful for this purpose. Feeding experiments have shown whey to be approximately half the value of separated milk.

As in the case of other milk products, whey should be pasteurised before it is fed to pigs in order to minimise the risk of disease in the stock.

PLATE 150.

These pigs were hand fed twice daily a mixture of 80 per cent. barley meal, 10 per cent. lucerne chaff, and 10 per cent. meat meal, and given water and green lucerne as well. From 37 to 151 lb. live weight they gained 1.2 lb. daily, and made good bacon after slaughter, thus demonstrating that pigs can be grown satisfactorily without milk when meat meal is used. Each pig consumed an average of about ⅓ lb. of meat meal daily.

(4) Pasture and Forage Crops.

Although the pig requires concentrates such as grains or meals for best results, it is naturally a grazing animal and is contented when it has the run of a good pasture paddock where it can graze and partake freely of fresh air, exercise, and sunlight, all of which assist in promoting health and growth.

Pasture is usually a comparatively cheap food, and as its use reduces the amount of other more expensive foods required, the maximum use should be made of succulent, nutritious pastures in pig feeding. While permanent grass pastures are useful, a larger bulk of food per season and more palatable food can be provided by cultivated crops.

A considerable saving of labour is effected when the pigs are allowed to do some of their own harvesting, and in this respect the "hogging down" of maturing maize crops provides pigs with the grain requirements of their ration, with a saving of the labour required in harvesting the crop by hand.

Pigs running on good grazing land have less chance of suffering from deficiency of necessary nutrients than pigs which are confined in bare yards or pens and hand fed. The rotational cultivating, cropping, and grazing of pig paddocks helps to maintain the fertility of the land and provides one of the most practical means of controlling diseases and parasites—particularly kidney worms and round worms, which cause serious losses to the pig industry.

It has been pointed out that the greater part of the protein in a plant is present in the young growing portion, and as a large amount of protein is required by pigs, the pasture crops are best fed off when they are young and rich in protein; also at this stage, the crops are more succulent and contain less fibre, thus making them more valuable as pig food. While cattle make fair use of mature grazing crops, pigs make much better gains when fed on crops which have not reached the stage of maturity.

While there are advantages in providing annual crops for pigs, permanent grass pasture is sometimes necessary about the piggery. A mixture of summer-growing and winter-growing grasses with some lucerne or clover makes the best permanent pasture, but some grasses on their own provide good grazing. Perhaps the most outstanding single pasture grass for pigs in our Queensland pig-raising districts is Kikuyu grass. It is a vigorous grower, and when well established stands heavy stocking. The nature of its growth enables Kikuyu to withstand a lot of rooting and tearing about which pigs give a pasture. It is palatable and nutritious and will thrive in a wide range of climatic conditions.

Pigs sometimes do a lot of rooting and destroy a good deal of pasture, and to check this habit they should be removed to another paddock or the snouts should be cut or a ring inserted in the snout to prevent the pigs from rooting. Once pigs have learnt to root, it is difficult to stop them, but a good deal of success has been achieved where young pigs have the top cut off their snouts when they are about six weeks old.

While a good deal of damage may be done by pigs rooting up a lucerne or a paspalum paddock, in many cases the rooting does good; in fact, pigs have proved themselves good pasture renovators on matted paspalum paddocks which required breaking up.

Lucerne.—When one thinks of forage crops he must first consider lucerne which is one of the best all-round stock foods. Although it is still a fairly common idea that lucerne will only grow on deep, rich alluvial soils, it has been demonstrated that this crop will grow with varying amounts of success on a very large range of soils, both on the lowlands and the highlands, provided sufficient care is taken to establish

it properly; the ground should be in sweet condition, well cultivated, free from weeds, and containing ample moisture before the lucerne is sown. Once the stand is established it should be grazed and cut with intelligent care and cultivated and top-dressed as required.

Pigs are severe at times on a lucerne crop, and care should be taken so that they will not destroy the stand; they should be grazed for short periods only, then the lucerne should be mowed. The young growth of lucerne—before it commences to flower—is much more palatable to pigs than the more mature crop, of which the pigs eat very little stalk.

Lucerne, like all other legumes, is rich in protein and minerals, and, therefore, valuable for young pigs and breeding stock. It is palatable and readily eaten by pigs of all ages. Young, succulent lucerne, has a slight laxative action on the bowels and so helps in maintaining the animal in health. Good quality lucerne hay that is not too stalky makes excellent roughage for pigs; although it must only be fed in limited quantities to young stock, breeding sows can be maintained in good condition in lucerne hay with a small amount of grain. Pigs do not always appreciate lucerne hay for a start, and they may be given a little chaff or lucerne meal, either dry or soaked, and mixed with other foods until they become accustomed to it. The best way to feed lucerne hay is by placing it in a rack where the pigs can take it at will; a trough should be placed under the rack so that any leaf falling from the hay will be collected for the pigs. Farmers who have a supply of maize, lucerne, and separated milk have the material for supplying excellent rations to pigs, and in periods when the milk supply is low a good deal of the protein content can be made up by lucerne hay, which can be stored in a time of plenty.

There have been cases where a yellowish colour in pork—detrimental to the trade—has resulted from prolonged grazing on green lucerne, and, therefore, some caution is necessary in feeding green lucerne. However, it is not definitely known what amount of lucerne is required to cause this undesirable colouring, but we know that pigs are often grazed on lucerne for months and no trouble results. To be on the safe side, the lucerne grazing should be used mainly for breeding stock and weaner pigs, and the other stock might be grazed only for short periods. This yellow colouring, which is due to a vegetable colour, may come from other crops as well as lucerne, and in this respect we can only say to feed all things in moderation.

Cowpeas.—Cowpeas are a leguminous crop like lucerne, but they are annual in growth and therefore not so useful as lucerne which lasts for many years. However, cowpeas often fit in well with the cropping practice of the farm and are a useful crop to grow in pig paddocks. Cowpeas are summer growing and require much the same cultivation as maize. The crop lends itself to feeding off when the foliage is green and the seed pods forming, but not ripe, or when more mature the crop can be made into fair quality hay. The climbing varieties of cowpeas are sometimes sown together with maize when the paddock is to be fed off by pigs. The cowpea vine has a characteristic flavour which pigs do not always appreciate readily. This may be overcome in handfeeding by allowing the plants to wilt in the sun for a time after they are cut and before feeding to the pigs.

Field Peas.—Field peas have a similar use to cowpeas, but they are a winter-growing annual crop and require somewhat the same conditions as the winter-growing cereals. Field peas are a protein-rich crop which can be fed off before the seed pods are ripe, or it can be made into fair quality hay, which, together with the peas, makes an excellent food for breeding stock. Sown with barley, oats, or wheat, and fed off in the young growing stages, field peas provide a nicely balanced pasture.

Field peas and rape fit into the pig paddock cropping system in winter, as cowpeas and soybeans fit in during summer; the cereal crops, of course, can be used, but these protein-rich crops just mentioned should always predominate in the pig paddock cropping.

Soybeans.—Soybeans are a summer-growing legume with a feeding value approximating that of the cowpea or field pea. This crop also makes good green forage or good hay.

Peanuts.—Peanuts may be used as a forage crop for pigs, both the foliage and the nuts being eaten. A common practice is to turn the pigs into a field which has been harvested, allowing them to clean up the nuts which have been missed. Peanuts are highly nutritious, containing more than 40 per cent. of protein and being rich in fat. Peanut meal is available on the market and is a similar food to linseed meal. The peanut meal is the residue after most of the oil has been extracted. A characteristic of peanut fat is that it is liquid (oil) at very low temperatures, and animal fat made up from peanut oil will not harden under ordinary chilling treatment with the result that pork or bacon carcasses from animals that have been fed on large quantities of peanuts are soft and oily and unsuitable for the trade.

Owing to their high protein and oil content, peanuts produce very rapid growth in pigs, and put a bright sheen on the pig's coats, and therefore their use may be advocated for sows and litters up to weaning time, or for exhibition stock, but for porkers and baconers their use is dangerous, and for safety it should be discontinued soon after weaning.

Rape.—Rape is an annual crop which should be sown in March, April, or May, and in normal seasons should be ready for feeding off in two or three months after sowing. The cost of seeding rape is comparatively light and the return from it is usually two or three grazings of succulent and nutritious fodder. When it is desired to crop a pig paddock in the interests of sanitation and worm control, rape will be found a most useful crop.

Rape has not the same feeding value as lucerne, but its nutritive ratio is almost the same and it is classed as a nitrogenous fodder although it is not a legume. It happens occasionally that when young, tender-skinned pigs are grazed on rape which is wet with dew or rain, the rape has an irritating effect on the skin. This point should be watched in feeding rape.

When the rape crop has been practically eaten down with only a few leaves showing on each plant, the stock should be removed until the crop recovers. In this way several grazings can be obtained in a season.

Cereal Crops for Forage.—For supplying green forage quickly in spring and summer, maize is very useful, being a quick grower, and it can be used at almost any stage of growth. If fine stems are required,

the maize may be grown thickly in rows or broadcast. This is a wise practice if it is known that the crop will be wanted as greenstuff for pigs because pigs make much better use of the finer-stemmed young maize than they do of the larger stems.

Oats, wheat, and barley either sown alone or with rape or field peas provide very useful pasturage during winter, and if carefully grazed the feeding period may be successfully extended over several months. These crops should be grazed when they are about 10 inches high for at this stage the plants are more succulent, more palatable and contain more protein and less fibre than they do in the later stages of growth. The grazing should be so arranged that the crop is eaten down quickly and then rested until it is sufficiently re-established for grazing again.

Pigs should be moved from the crop paddock during wet weather if it is practicable, as their tramping and rooting may seriously effect the physical condition of heavy soils.

(5) Root Crops.

Sweet Potatoes.—In many parts of Queensland, sweet potatoes are a great standby for the pig raiser during a dry winter and spring, the crop remaining in the ground or in the barn from the time it is mature until it is required for feeding.

Sweet potatoes are a bulky carbonaceous food which may be used to some extent to replace grain in the ration and to add variety and succulence. About 4 lb. of sweet potatoes are equal to 1 lb. of grain. Where soil and climate suit the crop it is inexpensive to produce and is easily stored. The best means of harvesting in most cases is by turning the pigs into the paddock. It is not only the tubers that are useful as food, but the vines also make good green fodder, although here a warning must be given to the effect that there are on record, cases of prussic acid poisoning following the feeding of sweet potato vines to pigs. These cases, however, are so very few compared with the large number of pigs which are fed on this crop, that the risk of poisoning would appear to be very slight. The feeding of molasses is recommended to counteract any ill-effect from the vines.

When pigs are fed on a fairly large amount of sweet potatoes they should be given liberal supplies of protein-rich foods such as separated milk and meat meal.

Arrowroot (*Canna edulis*).—The arrowroot grown in the coastal districts of Queensland has a place in pig feeding in those districts on account of its heavy yielding and hardy nature and its ability to stand in the field for a long period before being harvested. Arrowroot is not a very nutritious crop, but it supplies a large bulk of succulent food which pigs relish.

Arrowroot is sometimes harvested and then boiled before being fed to pigs, but when one sees pigs harvesting the crop for themselves and doing very well and wasting very little of the crop, one wonders if boiling is really a wise practice. Although most of the nutriment is in the bulbs of arrowroot, the pigs will eat the tops which are usually very succulent. Arrowroot is a carbonaceous roughage and should be fed in combination with more concentrated and protein-rich foods. When feeding off arrowroot—as with all crops—it is advisable to run a

temporary fence across the block to confine the pigs to a small area until they have harvested it satisfactorily. In this way, the waste can be kept at a minimum.

Mangels.—The particular value of the mangel as a root crop for pig feeding lies in its ability to withstand a dry spring, provided it is well established in the autumn. The growing period is somewhat long, but if sown in the autumn, the mangel should be ready for feeding early in the following summer when other succulent fodders are usually scarce, and if it is not required when fully grown, the crop may be left in the ground for a few months without much deterioration resulting.

Mangels are a bulky, watery food containing about 85 per cent. of water, but they are succulent and palatable and at the same time they supply a certain amount of nutriment in the form of protein and carbohydrates. Like the sweet potato and arrowroot, mangels are a heavy yielding crop and worthy of a place in the cropping system of pig feeding.

Artichokes (Jerusalem Artichokes).—Although the sweet potato takes the place of artichokes in most cases on account of its heavier yielding capacity, artichokes are grown to some extent as a pig food. The artichokes might be expected to give about two-thirds of the yield that sweet potatoes would give, but they have a narrower nutritive ratio than sweet potatoes, being richer in protein and lower in carbohydrate content.

Artichokes are grown in a similar manner to sweet potatoes, except that they are propagated by tubers. If planted in the spring, artichokes should be ready to harvest in autunm, but if desired they may be left in well-drained soils right through the winter before harvesting.

The tubers may be dug by hand or ploughed out or the pigs may be turned on to the crop to do their own harvesting. If hand dug, sufficient tubers may be left in the ground to give a crop in the following season, and if the pigs are doing the job they should be removed before all the tubers have been eaten out and the land should then be harrowed and left to produce the next season's crop. Being a carbonaceous roughage, the artichoke should be fed together with nitrogenous foods and concentrates.

Potatoes.—The ordinary English potato is usually too high in price as a human food to be used for pigs, but there are times when unmarketable potatoes are available for pig food. They are a carbonaceous food of fair feeding value and should be boiled before feeding to the pigs. About 4 lb. of potatoes are equal to 1 lb. of grain as pig food.

(6) Miscellaneous Foods.

Pumpkins.—In practically every pig-raising district of Queensland, pumpkins can be grown with comparatively little trouble, and their usual heavy yields, together with their excellent keeping qualities, make this crop one of the most important for the pig raiser. Pumpkins contain over 80 per cent. of water and therefore are bulky, but they are palatable to pigs and are best fed raw. The seeds of pumpkins contain fair amounts of oil and protein, and they also act as a mild vermifuge (i.e., they expel worms from the digestive tract of pigs) so the seeds should not be wasted, but they should be fed with caution as digestive troubles sometimes occur when excessive amounts of seeds are fed without the flesh of the pumpkin.

The market value of pumpkins is sometimes so high as to make them too valuable as human food to be given to pigs, but on the whole, a large portion of the pumpkins grown in Queensland are fed to pigs. They can be ready for feeding in a good season from December onwards and if stored in a dry, cool place and picked over frequently to remove the rotting ones, the pumpkin supply can be kept up till the following summer.

Pigs relish pumkpins and the crop fits in the cropping system very well and they are useful when fed in combination with maize, milk, and lucerne. Cases of yellow colouration in the pork of pigs fed heavily on pumpkins have been reported, and in this respect care should be taken not to overdo pumpkin feeding with porkers and baconers.

Melons.—Melons are sometimes used as pig feed, but contain about 95 per cent. of water and are therefore not so nutritious as pumpkins which contain about 83 per cent. of water.

Molasses.—Molasses has its uses as a pig food, but unfortunately its value is often over-estimated and farmers expect it to do more than it really can with the result that various dietetic troubles occur in the stock. Molasses contains about 57 per cent. of digestible carbohydrates which are in the form of sugar and its digestible protein is nil. It is therefore a fat, heat and energy producing food, but not a flesh former.

Molasses has a laxative effect on stock and for this reason it is valuable, during dry seasons when succulent green fodder is not available and particularly for breeding sows which are sometimes inclined to become costive about farrowing time. Stock are very fond of molasses once they become accustomed to it, and this high degree of palatability makes it a useful addition to a ration containing less palatable foods. Molasses should only be given to pigs in small quantities at any time, for if it is fed carelessly severe diarrhœa may result.

When grains or other carbonaceous foods are not available cheaply, molasses may be used with success provided it is not overdone; the excreta of the pigs will give a good indication of when the safe limit is reached. Molasses should always be fed in combination with protein-rich foods such as milk or meat meal, as it supplies no protein to the animal.

Garbage.—Waste foods from private house, boarding-house, hotel, shop, cafe, hospital, and home can be put to good use through the pig which will change waste into edible pork with a fair degree of efficiency, and provided the business is properly founded and well conducted, garbage feeding of pigs can be a profitable undertaking.

The composition of garbage varies to such an extent that it is very difficult to say anything definite about its feeding value. Garbage which has been collected and kept fresh until fed to the pigs and which contains mostly bread, meat, fruit, and vegetables, and is free of foreign matter such as soil, cloth, paper, glass, &c., and which does not contain too much water, is a valuable food. Excessive amounts of water, fruit, and vegetables reduce the feeding value of the garbage.

Garbage feeding is usually carried on near to the cities and large towns by farmers who collect the food in water-tight containers either daily or several times weekly, and cart the food some miles to their farm; thus the greatest expense in garbage feeding usually is in the cartage which is done either by motor truck of horse-drawn wagon.

It is a general practice to boil garbage for an hour before feeding it to pigs. This is a safeguard against disease to some extent, and at the same time the cooking increases the palatability of most garbage. During the boiling, any excessive amounts of fat can be removed by skimming. When too much fat is given to the pigs they tend to become soft in the carcass, and so are unsuitable for the bacon curer or the pork butcher.

The addition of grain and green fodder to garbage improves the ration considerably. Weaners do not thrive on ordinary garbage and they should be given other more nourishing foods until they are about 60 lb. weight. Then the change to garbage should be gradual. Garbage containing fish should not be fed to pigs being grown for pork or bacon as the fish flavour is very strong and taints the carcass.

There is always an element of risk in garbage feeding for one never knows when some poison on injurious substance may find its way into the garbage, and result in the loss of a number of pigs. Swine fever may be carried through pigs eating the flesh of pigs suffering from swine fever. Salt poisoning occurs occasionally through brine from pickled meat being placed in the garbage for pigs. Pigs appreciate a little salt, but large amounts cause death.

TUBERCULOSIS IN PIGS.

Tuberculosis is an infective disease to which both men and animals are subject, cattle and pigs being the stock most susceptible to infection. The significance of the disease in the pig has yet to be fully appreciated by farmers engaged in the industry, observes a New South Wales departmental leaflet, which proceeds to impress upon pig-farmers the necessity for strict supervision of their methods of management.

There is no practical method of treatment of tuberculous in animals, it is pointed out, but attention to the following precautions the disease may be kept under control:—

1. As cattle are the main source of infection, the tuberculin test should be applied to the herd and all reactors removed.

2. Do not allow pigs to roam about pastures and yards used by cattle unless it is definitely known that there is no tuberculosis in the herd.

3. All skim-milk and other dairy products should be heated to 180 degrees Fahr. and kept at that temperature for fifteen minutes before fed to pigs.

4. All refuse, slaughter-house offal, and similar food should be boiled before it is given to pigs.

5. In view of the possibility of pigs gaining infection from poultry affected with tuberculosis, pigs should not have access to runs used for poultry.

6. Where tuberculosis is found to be present in the herd, all suspected animals should be slaughtered, and where this is done under qualified supervision the carcasses which have only a slight infection of the head glands will be passed for human consumption, the affected parts only being condemned. The pens should be thoroughly disinfected and limewashed, disinfectant being added to the lime. All litter and rubbish in the yards should be burned and the ground loosened and treated with quicklime.

7. In the case of stud pigs, if tuberculosis is suspected of affecting any of the animals, arrangements should be made to test the whole of the pigs. The reactors could then be removed.

Fresh air and sunlight are great enemies of the tubercle bacillus. Hence pens and sties should be open and airy, and have no damp dark corners to which the air and sun cannot penetrate.

Incubation and Brooding.

By P. RUMBALL, Poultry Expert.

When to Hatch.

ALTHOUGH incubation may be successfully practised throughout the year, the results obtained from the stock reared are not always satisfactory. It is generally conceded that the best months for hatching are July, August, and September. Heavy breeds hatched during the latter part of June and light breeds early in October will, in some people's hands, prove satisfactory. Chickens of any breed, provided the parent stock are in good condition, hatched in February and March also thrive, but unfortunately they commence production during the period of plenty, and generally moult at or about the same time as the chickens that were hatched and commenced laying six months earlier.

Selecting Eggs for Hatching.

Care in the selection of eggs which are to produce the future layers is essential. They need to be selected for (*a*) size, (*b*) shape, (*c*) texture of shell, and (*d*) colour.

Although like does not produce like with any degree of certainty, constant selection to a certain degree will tend to fix the qualities aimed for. Size is undoubtedly an inherited quality and one of the features which have an important bearing upon successful poultry raising. Breeding birds should be selected early in life for size of egg, as it is only by this means that a strain of fowls can be built up which will lay a good marketable egg in their pullet year. The eggs laid by the hen vary in size from day to day. This variation at times exceeds a quarter of an ounce, consequently in the selection of eggs for size it is not wise to make a 2-oz. egg the minimum weight. Aim at eggs which will average about 26 oz. to the dozen as there is always the tendency in breeding for egg size to diminish rather than increase.

Although shape does not materially affect the market value of eggs, a uniform article is desirable for marketing purposes. Misshapen eggs invariably are poor hatchers, and for this reason also should be discarded. In all table-top machines the heat is radiated from above the eggs with the result that there is a greater heat 1 inch above the egg tray than 1 inch below. In some types of machines the difference is as much as 6 degrees. As the embryo of the egg always finds its way to the uppermost surface of the egg it will be readily seen that large eggs will hatch much earlier than small eggs, and that to obtain even hatches only eggs of uniform shape and size should be used.

Texture of shell varies considerably with the feeding and general condition of the stock, but it is also possible for this feature to be hereditary. Apart from this uniform shell structure makes for improved hatches, and eggs with shells of poor texture should be discarded. Colour of shell is not an important feature upon the local markets, but from light breeds white-shelled eggs should be produced and from heavy breeds brown-shelled eggs. It is suggested that no harm would be done by trying to maintain these characters—in fact, with brown-shelled eggs the deeper the brown the better the appearance.

Keeping Eggs for Hatching.

Eggs required for hatching purposes should not be kept for a longer period than ten days. If they were set five days after laying better results could be expected than when they were ten days old. It is, however, necessary to keep them sometimes longer than five days and occasionally even longer than ten, therefore they need to be kept under the best conditions. A uniform cool temperature is desirable, one slightly under 60 deg., if possible. The room where they are stored should be dry and not moist. Although fresh air is desirable, direct currents of air are detrimental on account of the drying-out effect they have upon the egg. A good plan is to store them in strawboard fillers in cases. This prevents, to some extent, the undue drying out of the moisture content and facilitates the daily turning of eggs that are to be retained for any period. All that is necessary is to rest the case every alternate day upon a different side. The necessity of turning is due to the fact that the germ cell always comes to the uppermost surface of the egg, and if left undisturbed would stick to the membranous lining of the eggshells.

Methods of Incubation.

Incubation may be practised either by natural or artificial means. The necessity of having chickens hatched at certain periods of the year and the constant improvement that is taking place in our commercial flocks makes it increasingly difficult for the poultry raiser who desires to keep a 100 or so good-laying hens to use the broody hen, consequently artificial methods of incubation are resorted to by 90 per cent. or more of poultry raisers.

The period of incubation of eggs varies considerably. With hens it is 21, English ducks 28, Muscovy ducks 34 to 35, geese 28 to 30, and turkeys 30.

Natural Incubation.

When the hen is used for hatching purposes she generally finds her own nest. The best plan is to allow her to continue using it, merely protecting her from rough weather and preventing other birds from laying in the same nest. Her eggs, however, should be removed and replaced with eggs which came from the best of stock, failing this there would be rapid depreciation in the productivity of the stock. As she is expected to remain on the nest for a period of three weeks and will not make free use of the dust bath, she should have a dusting with some insecticide prior to the eggs being placed under her and another a few days before the chickens are due to hatch.

Red mite or tropical mite is possibly one of the most common and irritating parasites that trouble poultry. They multiply very rapidly when unchecked, and a sharp lookout should be kept for their presence, for if allowed to infest a broody hen the irritation will often cause her to leave the nest. Scaly leg is also a condition which should be avoided with the broody hen. The scale is caused by a parasite which may infest the legs of chickens very soon after hatching and result in an increasing number of birds with that unsightly leg. Not only is such a leg unsightly, but the parasite is detrimental to the development of the young.

The number of eggs to be set under a hen varies with her covering capacity. She should never have more than she can comfortably sit upon. The broody hen turns her eggs at frequent intervals, and those

in the centre will eventually find their way to the outside of the nest. If the hen has more than she can cover the outside eggs become chilled, and owing to the hen's action in turning the majority would in time become chilled and the embryo destroyed. The hen should be fed exclusively upon grain, and have plenty of dry grit and water before her at all times. The best results will then be obtained by leaving her as much as possible to herself.

A good and economical lice powder may be made up of the following ingredients:—One and a-half pints of petrol, a half pint crude carbolic acid, and plaster of paris.

First mix the carbolic acid and petrol, then stir in slowly the plaster of paris. Only use enough of the plaster of paris to take up all the liquid. Spread the moisture upon paper to dry out, and then store in airtight tins or jars. A small tin with holes punched in the lid is an efficient and economical means of distributing the powder through the feathers of the bird.

Location of an Incubator.

The incubator should be set up in a room where there is as little variation in temperature as possible. If a special room is to be built it should have two roofs with a space of 6 inches to 1 foot between each. The outer roof should overhang several feet on all sides. Such a roof permits of a free circulation of air between them and prevents an undue increase in room temperature by the rays of the sun when overhead, and the overhang protects the walls. If it is found that late in the spring the overhang is insufficient protection from the afternoon sun, a curtain can be suspended to afford greater protection.

Ventilation should be provided by windows and adjustable vents in the inner roof and bottom of the walls. These can be operated according to the number of machines working in the room and the outside temperatures. Direct draughts, however, should be avoided. Where it is not desired to go to the expense of building a special incubator room, an enclosure may be made under the majority of dwelling-houses. If it is situated under the centre of the house it is well protected from the sun and the temperatures are therefore fairly uniform. When the incubators are so situated it is essential that insurance companies be notified.

Heating of Incubators.

The majority of incubators are heated by kerosene lamps. The lamps should be thoroughly cleaned daily, and the burner boiled in water, to which washing soda has been added, after each hatch. New wicks should be used for each hatch. In starting, do so gradually. If a large flame is used when first warming up the machine it frequently leads to smoking of the lamp. A good grade oil is essential, and in adjusting the flame turn it up a little higher than necessary and then reduce to the desired height. This action makes the last pull upon the wick down and guards against a flame running up. Wicks of a correct size are essential.

The lamp should be cleaned and filled early in the afternoon. By doing this at this period all char is removed ensuring the maximum heat from a given-sized flame during the cold night, at the same time the operator has ample time to make the correct adjustments before retiring for the night. In trimming the wick do not use scissors. Rub off the

charred crust with a match and thoroughly clean the hands before handling eggs, otherwise the eggs may become smeared with oil, with the resulting injury to the embryo.

Beginning the Hatch.

Heat up the machine a couple of days before eggs are to be set, and after the machine is thoroughly warmed up commence to adjust the regulator. When the operator is sure that the regulation is correct the eggs may be set. This is better done in the morning so that the eggs will be thoroughly warmed up before nightfall, as it is asking a little too much of the heating ability of many machines to warm up cold eggs and maintain the correct temperature during a cold night. When the eggs are placed in the machine the temperature will fall. After a time the regulator may be lifting and the correct temperature not showing; this is due to the thermometer being nearer the eggs than the capsule which is affected by the coolness of such to a greater degree. The regulation should not be interfered with, as when the eggs are thoroughly warmed, if adjustments have been made carefully in the first instance, the damper will only lift in the event of excessive heat. Once having adjusted the mechanical regulation, any further regulation should be made by the flame, as regulators have their limits and it is unwise to place undue strain upon them.

Thermometers.

All thermometers should be tested prior to the commencement of every hatch, and again at any time that you cannot reconcile the actions of the regulation system with the temperatures. This can be done by placing a clinical and incubator thermometer in a basin of water and gradually increasing the temperature until the clinical thermometer reaches a temperature of 102 deg., and then observe the temperature indicated by the incubator thermometer. If there is any difference, the necessary allowance can be made. If it is expected that there is any serious fault in the incubator thermometer, and no clinical thermometer is available for testing purposes, the bulb can be placed under the tongue. It should read then 98 deg. This method is not as accurate as that described, but it will indicate serious trouble. Incorrect thermometers have been responsible for many poor hatches, and even new purchases may not prove correct.

Temperature.

Temperatures at which incubators are to be operated vary with the position in which the thermometer is situated in the machine. The heat of table-top incubators comes from the top of the machine, consequently the higher in the machine the bulb of the thermometer the greater the temperature shown. The correct temperature when the middle of the bulb of the thermometer is on a level with the top of the eggs is 102 deg. A thermometer hung with the bulb free of the eggs should read about 103 deg.

The heat within the machine is controllable by capsules or thermostat. Occasionally these get out of order by the former leaking or by the latter becoming bent. Very little can be done for a bent thermostat, but capsules may be repaired. The capsule system of regulation is that most commonly used. The capsule is a thin metal container filled with alcohol and ether. This capsule expands with

heat bringing into play the regulating device, allowing surplus heat to escape from the egg chamber, or preventing the intake of heated air. If the capsule is thought to be faulty and difficulty is encountered in regulating the machine, it can be tested by placing it into warm water for a few seconds. If expansion takes place it will prove that the capsule retains some of the liquid, and if no escape of gas can be detected by smell it is reasonable to assume that it is in good order.

During the course of the hatch the temperature will increase slightly, and just prior to hatching may go as high as 104 deg. This extra temperature is due to the increase in animal heat of the developing embryo, and need cause no worry unless it is excessive.

Turning.

Begin turning the eggs at or about forty-eight hours after setting and continue to do so twice daily until the nineteenth day. Occasionally, if the temperature has been a little too high, the eggs will pip on the eighteenth day. When this is the case, turning should cease as the chicken has put itself in a position to release itself from the shell.

When the eggs are placed upon the egg tray, set them at an angle of about 45 deg. with the large end up. To turn these it is necessary to handle every individual egg unless patent turning devices are used. This may be done by simply pulling the egg over upon its small end to the other side. After testing, turning may be done by gently moving the eggs over with the palm of the hand. Complete turning is not essential. All that is necessary is a movement sufficient to make the embryo seek another position in order to prevent sticking to the shell lining.

Cooling.

Cooling is a method of giving the eggs a thorough airing with the consequent strengthening of the embryo. The necessity of airing varies with the make of machine on account of the variation in the supply of fresh air. It is, however, important to remember that for the first seven days very little airing is required, and that the young embryo is very subject to chill. The time it takes to turn the eggs is sufficient. After the first week the eggs may be kept out of the machine until they have lost that burning heat. The period necessary will vary with the stage of development and the outside temperature. A good plan is not to cool the eggs to that degree that the correct temperature in the machine cannot be regained within an hour. In airing, place the eggs upon a table. Do not allow any portion of the tray to overhang, otherwise some of the eggs may become chilled owing to the greater circulation of air. Airing should be practised up until the nineteenth day, but if the eggs are then chipping they should not be aired.

Testing.

This should be done upon the seventh day. It may be done earlier, but the time necessary to do so may result in chilling; furthermore, the germ at an earlier age is not pronounced, and in brown-shelled eggs it is almost an impossibility to discern it unless a powerful light is available. All infertile eggs and dead germs should be removed. This practice gives more room in the tray, facilitates turning, and avoids live eggs being affected with the colder infertile egg. To test, a piece of cardboard having a hole in it similar in shape to that of an egg but

slightly smaller and a lamp are necessary. The cardboard is held up to the light and the egg placed against the hole in it. An infertile egg will be perfectly clear, a fertile egg will have a dark movable spot, about the size of the head of a match, with numerous blood vessels radiating from it, while a dead germ will show as a blood ring or streak, and generally stationary.

Ventilation and Moisture.

These are both interlocked. If a machine has a rapid circulation of air through it, it will require more moisture than a machine in which the circulation of air is slow. The reason why moisture is supplied is to prevent a too-rapid evaporation of the moisture content of the egg. Undue evaporation of the egg content is detrimental to good hatches and to the correct development of the embryo. Enlargement of the air cell naturally takes place due to the evaporation of the moisture content and the escape of carbon dioxide through the shell. This enlargement can easily be judged when testing, and if too great restrict the air circulation or increase the moisture content of the air passing through the machine. The reverse would be necessary if insufficient enlargement was not taking place. Many machines are supplied with moisture trays. These should be filled at the commencement of the hatch and kept filled throughout When moisture trays are not supplied the air, which passes through the machine, carries sufficient moisture at times. If it is necessary to increase the moisture content of the air taken in by the machine the floor of the incubator room can be moistened; this may have to be done daily in some climates.

Good ventilation is equally essential for the growth of the chicken within the egg as it is for the development of the chick when hatched. Without oxygen the changing of the egg content into a lusty chicken is impossible. If a fertile egg is examined upon the seventh day a network of blood vessels can be seen near the shell. The blood stream not only converts the food into the embryo but it carries off the waste product (carbon dioxide), and without a good circulation of air this poisonous gas is not removed sufficiently fast, and consequently has a weakening effect on the developing chicken. It will be understood that the more advanced the embryo is the greater is the need for oxygen and greater will be the amount of carbon dioxide given off; therefore, what will be the correct ventilation for the first few days will not suffice when the eggs are in the third week of development. The increasing of the ventilation at this period will also assist in the regulation of the temperature of the incubator. Again, when the chickens hatch, ventilation should be increased, and if the chickens are noticed panting the door of the machine should be left slightly open.

The Hatch.

After the last turning, on the nineteenth day, close the incubator and do not interfere with it until the hatch is over unless something unforeseen occurs. When the chicks have dried off give all the ventilation possible, darken the doors to prevent picking at the droppings or the toes of one another. It is as well to let them remain under these conditions for twenty-four hours, after which they may be removed to the brooder.

Disinfection.

Immediately the chickens have been removed from the machine it should be thoroughly cleaned and disinfected. A good disinfectant is

formalin. Any other good coal tar disinfectant may be used. The machine should then be closed up, and when dry opened and thoroughly aired before being used again.

Brooding.

Artificial brooding of chickens is a difficult process with an inefficient plant. The object of the breeder is to keep the chickens warm and comfortable and to wean them from heat as quickly as possible.

A good illustration of the requirements of brooding is given by the hen. She regulates the heat to the chicks under her care according to the age of the chick and weather conditions. If the chickens are young she moves about very little and sits fairly close and gradually increases her ranging habit as the chicks develop. Upon a cold wet day it will be noticed that she collects her brood frequently and warms them up.

In artificial brooding similar principles have to be followed with this difference—that the chickens have to be trained to do for themselves what the broody hen encourages.

Systems of Brooding.

Two systems of brooding are in common use in the State—namely, what is known as cold brooders and heated brooders. In both systems many types of brooders are used.

Cold Brooders.

The term cold brooding is a misnomer. Artificial heat is not supplied, but the heat of the body of the chicken is retained by means of cloths or flannel and a restricted circulation of air. This system of brooding has been practised for many years, but it is only in comparatively recent years that it has been used to any great extent by commercial poultry farmers. The illustration of the cold brooder will convey the nature of their construction. The cold brooder can be operated in brooder houses or rearing pens with an equal degree of success. Although the writer has operated the cold brooder with apparently equal results to the heated brooder, the latter is favoured. It can well be understood that the placing of chickens that have travelled a day or so under a cold brooder, which has to be warmed up with their own bodily heat will not be attended with as good results as would be the case if they were put under a heated brooder. Also, that in cold, bleak weather the heated brooder would offer greater advantages than the cold.

Heated Brooders.

There are many types of heated brooders, but they can be referred to as the box, the colony, and the battery. The former system is not used to any extent in this State. This, in the first instance, may be due to the cost of installation of a suitable type, and secondly to the general satisfactory results from the colony system.

Colony Brooder.

Where large numbers of chickens are to be reared the colony brooder appears to be the most economic, with the exception of possibly the newer system known as the battery, and as effective as any other type. With this class of brooder several hundreds of chickens can be run together with little more trouble and attention than would be

PLATE 151.—COLD BROODERS.

Showing numerous Cold Brooders being operated in a continuous house. Brooders taken from the house daily and placed in sun to air.

required for a lot of 100 under any ordinary brooding system. This system also permits of a very much freer movement of chickens once they have been educated as to the source of heat, and assists in the retention of that keenness in life that is essential to health and growth.

Five hundred chickens should, however, be the limit in any one colony brooder, but possibly 100 less would give better results. It is also generally a sound rule to depreciate the capacity claimed for brooders by most manufacturers.

The colony brooder consists of a heater with a metal hover for the purpose of deflecting the heat. The fuel used may be coke, sawdust, kerosene, or electricity. Whatever type of colony brooder is to be used should be housed in a special brooder house. It is possible to operate them in open-fronted houses by cutting off ground draughts, but it will be readily understood that when such is the case considerably more fuel is used. In the case of kerosene and electric-heated brooders the increase in the costs of heating in open-fronted houses would be considerable. With the sawdust and coke brooders costs are not excessive, but the great disadvantage with operating in open-fronted houses is to keep the heat at a uniform temperature. It is found in practice that they will burn out within a period of twelve hours and in some cases less with the consequent chilling of the chickens.

A suitable sized building to house a 500 colony brooder would be one that measured approximately 14 ft. by 16 ft. and at least 6 ft. high. The roof may be either a hiproof or skillion, the building lined and ceiled and provided with ample light. It should be built to face north-east or north and arranged so that the sunlight can be freely admitted. Lighting through glass is desirable in bad weather, but direct sunlight is essential to admit of the ultra violet rays. Failing this cod liver oil is an essential to all chicken-mashes, in order to supply Vitamin D. A few weeks of brooding without sunlight or cod liver oil would soon result in leg-weak chickens. Sunlight is the cheaper.

The house may be built of timber or iron. Iron is to be preferred, being of a more lasting nature and offering less harbour for vermin. The lining and ceiling should, for preference, be of ⅝-inch, tongued and grooved pine, but for economy wheat sacks sewn together and whitewashed will serve. The floor should be concreted to facilitate cleaning, and a thin concrete wall sunk into the ground to a depth of 18 inches. This wall prevent rats burrowing under the floor.

Battery Brooding.

This system of brooding is comparatively new to Queensland. It consists in the brooding of chickens under very intensive conditions with the practice of the maximum sanitation. The chickens are never allowed to run upon the ground. Day and night they are kept upon small mesh wire. This permits of the droppings immediately they are voided falling upon a tray situated so that is may be conveniently cleaned. Food and water are placed outside the brooder and the chickens fed through bars or netting according to the construction of the brooder. The food and water being in such a position that they cannot be fouled, and as the droppings are never upon the floor of the brooder, it is almost impossible for chickens to obtain disease producing organisms from other chickens.

PLATE 152.—A KEROSENE HEATED COLONY BROODER.
Showing curtain of hessian and wire for restriction of range.

The illustration is that of a home-made brooder which measures 3 feet by 6 feet. In this particular make there are two tiers. The floor is ½-inch netting and the dropping tray galvanised iron. The sides are movable. In the early stages of the chicken's life 1-inch netting is used, and as development takes place 1¼-inch netting. The chickens obtain their feed and water from the troughs by passing their heads through the netting. When the chick is very young the trough is tilted to facilitate feeding, and as development takes place lowered to a level position. This is done by a small wire hook which is attached to the tray.

This class of brooder has to be heated. In this case a small kerosene lamp is set up in half a kerosene tin under sleeping compartment. This tin only reaches to within 1 inch of the netting floor, consequently there is no one part of the floor excessively heated. Retention of heat is obtained by having a hessian curtain in front of the sleeping compartment and a hessian pillow filled with straw on the top. This pillow is kept low during early life and raised as the chickens grow. Naturally, ventilation must not be restricted to too great an extent.

The writer has seen chickens kept in this type of brooder until they were eight to ten weeks of age with no apparent ill effect. They are, however, naturally soft due to lack of exercise, and breeders are well advised to get them out of the brooder much earlier. When they are four to six weeks of age it should be possible to wean them from the heat in a manner similar to that used in other types of brooding.

It has been frequently noticed that chickens removed from battery brooders have been effected shortly after removal with coccidiosis. Mortality due to this disease has appeared to be greater upon the same farm with this class of brooded chicken than with any other. It has been suggested by some authorities that this is due to the heavy infestation with the organism responsible for the disease in stock that have little resisting power. Whatever the cause it demonstrates that, although chickens have been protected from the disease early in life by being battery brooded that they are still subject to an attack.

Temperatures.

In heated brooders temperature is a very important factor. If insufficient heat is supplied the chickens crowd together. The correct heat is the only method by which this can be prevented. Overheating is also to be avoided on account of its weakening effect and the difficulty that will be experienced in weaning from the brooders. The general comfort of the chickens is a sure index that the temperature is fairly satisfactory, and if the droppings are well distributed under and around the hover in the morning, it is proof that the chickens have been fairly comfortable. When the chickens are first put into the brooder they come from a nursery in the incubator which generally has a temperature of at least 90 deg., and it is as well to start your brooders at this temperature, gradually reducing it until heat can be dispensed with in from four to six weeks.

The importance of heat in brooding chickens has been demonstrated by investigators at the Michigan State College. Working with chickens from diseased free stock with a range of temperature from 72 to 96 deg. during the first week of brooding they experienced mortality from 37 per cent. to 5 per cent., and with diseased stock 57 per cent.

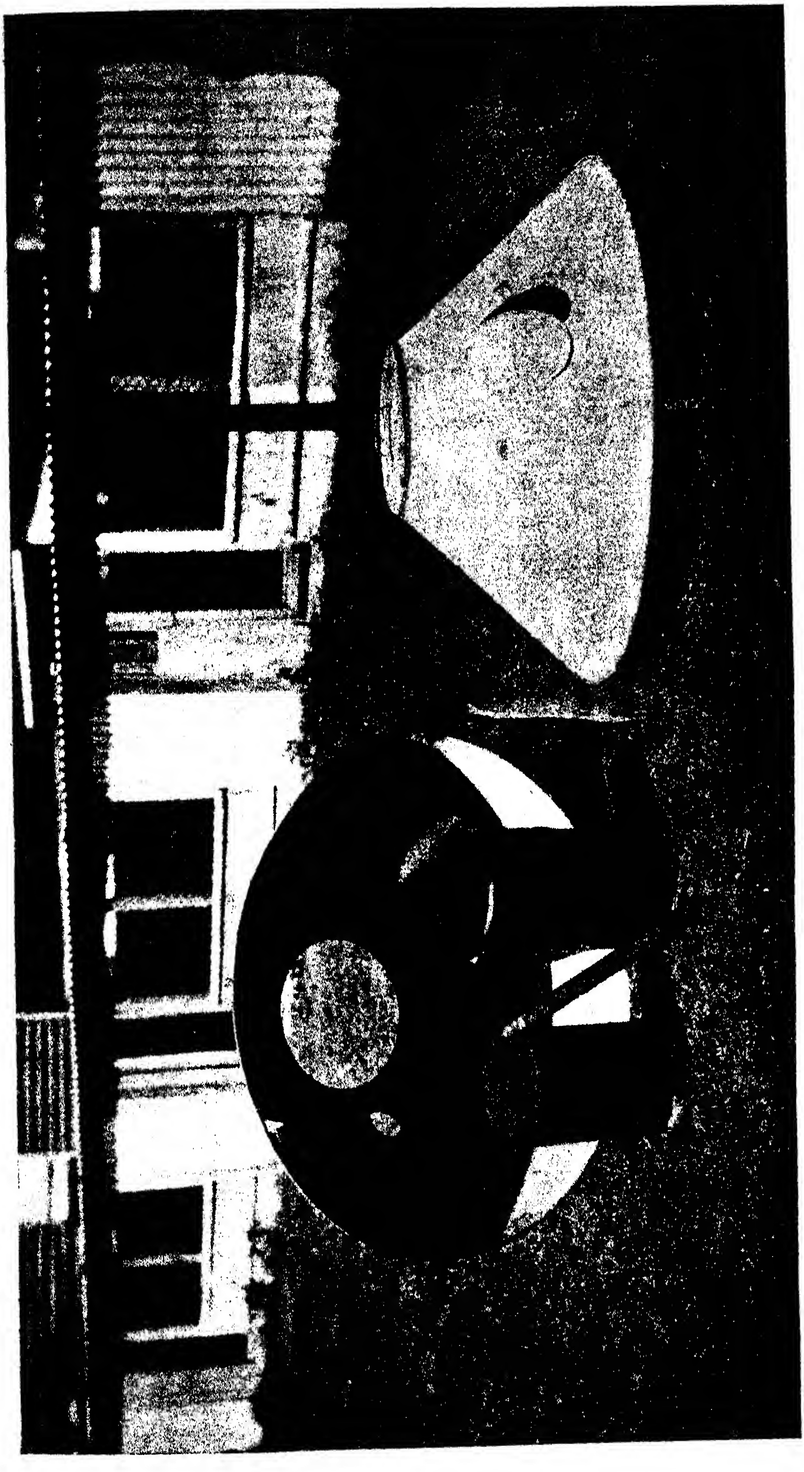


PLATE 153.—A SAWDUST-HEATED COLONY BROODER.

Showing fire bucket filled with sawdust which is fitted into the cylinder on right. Note core in centre of bucket for draught.

to 32 per cent. These experiments were conducted over a period of two years and amply illustrate the importance of temperature.

Ventilation.

With some types of brooders many chickens are lost due to lack of ventilation, and to overcrowding. Brooders which are usually made to hold a 100 day-old chickens are generally too small for the same number of chickens a week old. It frequently happens also that the attendant makes no allowance for additional ventilation with the growth of the chickens, and although he has been successful in rearing them to the age of one week they then start crowding and dying. The lack of ventilation has a great weakening effect on both young and old stock.

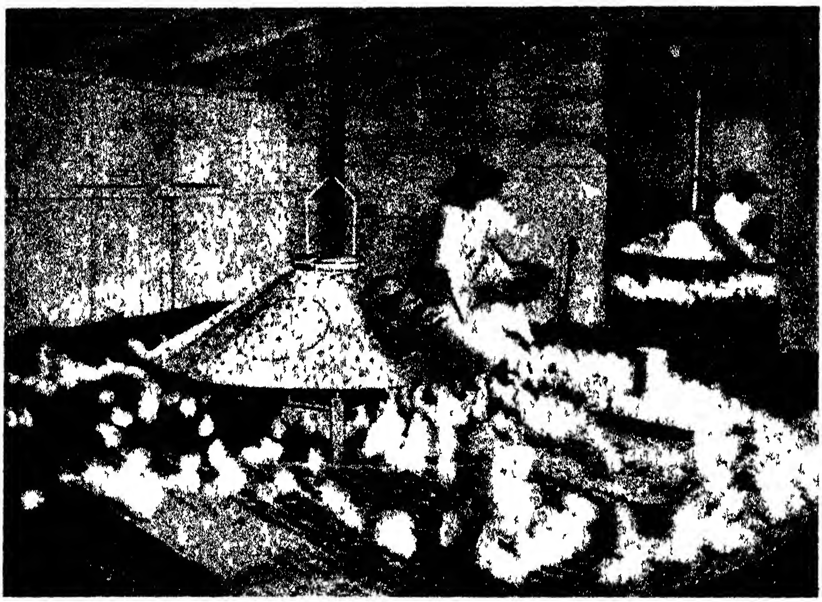


PLATE 154.—A COKE HEATED COLONY BROODER IN USE.

It causes the young to crowd, and renders the older birds more susceptible to disease When chickens have crowded they present a wet appearance in the morning, to which the term of "sweating" is applied. Sweating is not the cause. The wetness is caused by the condensation of the moisture content of the breath which would have been carried away if proper ventilation had been provided. Chickens which have been overcrowded rarely recover from the ill-effects, and it should be avoided at all costs.

In brooding under any system the following are essential points:—

(1) Limited range, increasing with age.

(2) Sufficient heat, which should be reduced as early as possible.

(3) Ventilation, which should increase with age.

(4) Correct accommodation. What is just enough room for 100 day-old chickens rapidly becomes too little as they grow.

(5) Never attempt to brood chickens of mixed ages.

PLATE 155.—HOME MADE BATTERY BROODER.
Showing Simplicity of Construction.

Placing Chickens in Brooders.

When chickens are placed in brooders the floors should have a light dressing of sand or soil to absorb any excreta and to give the chickens a good footing. A small amount of litter in the nature of soft straw or chips will provide exercise and tend to keep the chickens active and prevent vice.

With both hot and cold brooders their liberty should be restrained for a start. This can be done by erecting a barrier of wire netting around the brooder increasing the area day by day. At the end of about one week they can be given the liberty of the brooder house. With the cold brooder the netting should only allow a range of two or three inches for the first day. With the colony brooder the range will depend upon the heat given off by the brooder.

What is necessary is to educate the chickens as to the source of heat, and when this is done to encourage them to take as much exercise as possible by ranging over the entire brooder house.

Most breeders have outside runs to their brooder houses, and the chickens are allowed out in them after they are about a week old. Outside runs are not essential if the brooder house is constructed to permit of abundance of light and sunshine. However, when runs are provided the chickens should be driven in after they have been out for an hour or so upon the first occasion. They may be allowed out again in the course of an hour or so. This should be repeated in order that the chickens will learn to return to the brooder house and avoid to a large extent the possibility of their being caught out in a rainstorm or staying out too long and becoming chilled.

Sanitation.

Cleanliness in every operation is essential; unsanitary conditions not only pollute the atmosphere of the brooders but are frequently the cause of the rapid spread of serious diseases in baby chickens. In very young chickens bacillary white diarrhœa is responsible at times for heavy mortality. The chickens are very subject to this disease within the first ten days. The organism responsible is voided in the excreta, consequently it will readily be understood that a few diseased chickens could be responsible for the spread of the disease among the whole brood. This fact emphasises the advisability of the destruction of apparently sick chickens and the regular and frequent cleaning of brooders.

Coccidiosis, another disease to which chickens are subject, is spread per medium of the droppings. With the former disease some disease effected chickens are the result of effected parents and when hatched are already diseased. With coccidiosis the chicken contracts the disease after hatching. Many adult birds are affected with coccidiosis. The organism is, therefore, easily carried upon the feet of the person attending them to the brooders. Strict sanitation and the application of precautionary measures gives reasonable assurance of protection against the disorder. Brooder houses should be cleaned out every second day and the sleeping quarters daily.

Weaning.

When chickens are from four to six weeks old it is generally necessary to remove them from the brooders to make room for others.

This is also necessary to protect the soil from becoming too foul and the chickens too soft by prolonged supply of heat. Correct brooding will materially assist the weaning process as the heat should have been gradually reduced.

The chickens were trained in the early stages of brooding and training is again essential. Poultry are largely creatures of habit and can generally with care be trained to act as required. When once they form a habit—good or bad—it is difficult to alter. A little time spent in seeing that chickens take to their new quarters during the first few nights will amply repay the poultry keeper, and prevent losses that occur when growing chickens crowd into corners, &c.

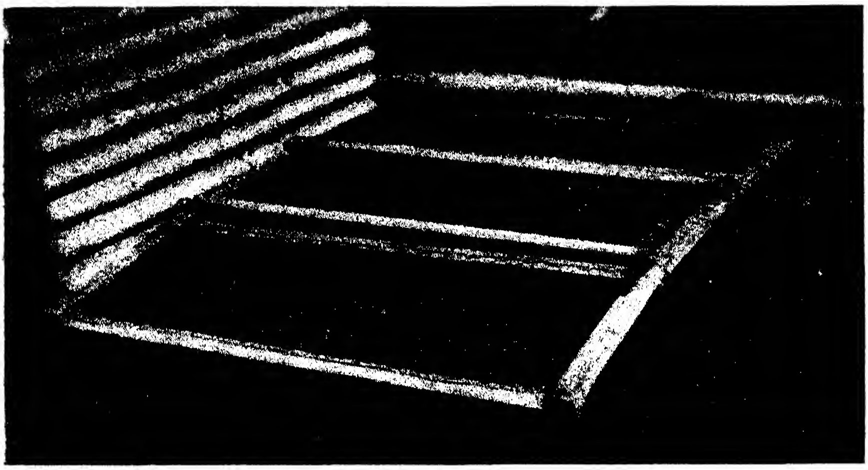


PLATE 156.

WEANING PLATFORM AS DESCRIBED IN TEXT.

Chickens may be placed in permanent laying quarters or colony houses when they are to be weaned. The permanent house may be an intensive laying shed or a special colony house. The colony house is an ideal system provided they are situated upon clean land, or in other words land not contaminated with the droppings of adult or diseased birds.

Colony houses can be built upon slides or wheels and moved about the fields or made fixtures. Hurdles or netted yards are necessary to confine the chickens to a certain area until they become accustomed to their new quarters. After a week or ten days these hurdles may be removed, and providing the rearing houses are not too close to one another, the chickens belonging to the various lots will not become mixed returning to their own quarters at night.

The number to be put out together, of course, varies with the accommodation available, but larger flocks than 100 are not recommended; 50 would be safer.

A good rearing house for 100 chickens should be at least 10 feet long and 8 feet deep, this, of course, with free range. The house should be 5 feet high at back and 6 feet high in front. Ventilation should be provided by leaving a space between the top of the back wall and

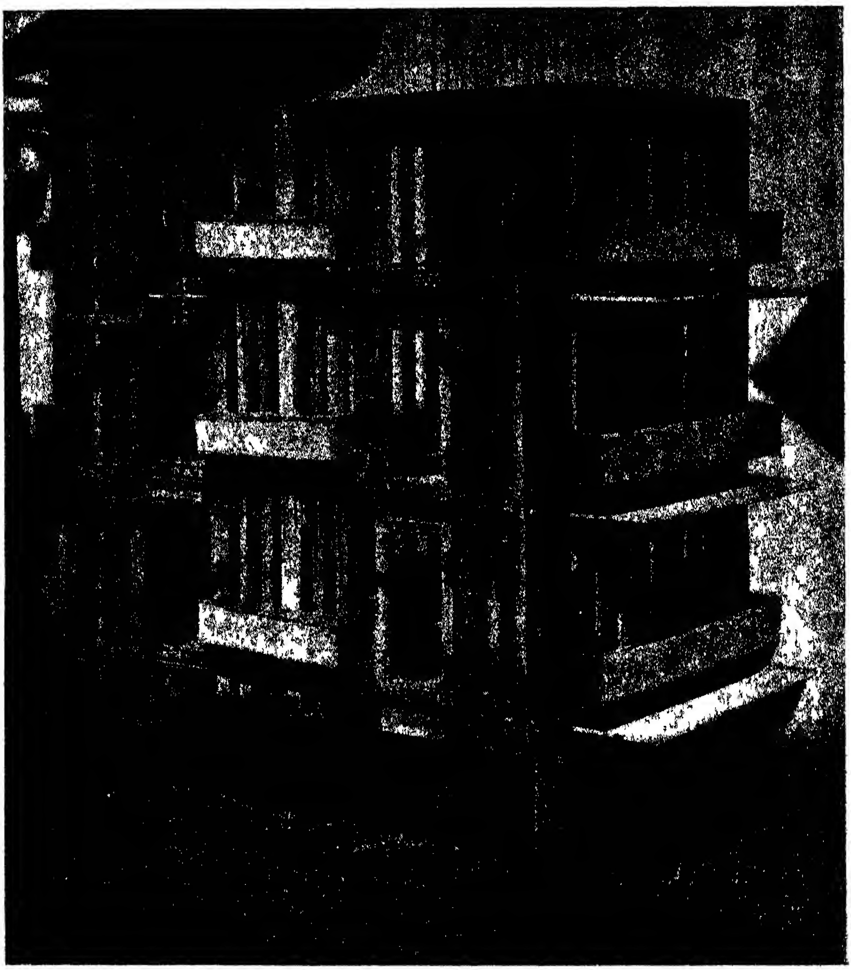


PLATE 157

BATTERY SUITABLE FOR THE RAISING OF COCKERELS AFTER LEAVING THE BROODER

roof of 3 inches. As a protection from the south-easterly weather at least 4 feet of the eastern front end should be covered with iron. The front should be netted and provided with a gate in order that the birds can be shut in overnight as a protection from foxes, &c.

General Management.

When the chickens are taken from the brooder quarters and placed in houses to be weaned they are too young to perch of their own free will. Various arrangements have to be made to prevent crowding. Some breeders bed them down on straw. The straw needs to be fairly deep and loose and well heaped up in the corners of the house. The chickens appear to be content to snuggle in the straw instead of making warmth by crowding together. It is then only necessary to go around in the evening with a fork and loosen the straw up. In the shaking the droppings fall on to the floor and are readily cleaned up. With this system of weaning, perches must be erected later and the birds allowed to take to them at will.

Another system of weaning and one that educates the bird to perch at the same time is to erect a wire netting platform about 6 inches from the ground with a netting run up. On the top of this frame several strips of 2 by 1 timber are attached. The chickens at night are not allowed to rest anywhere but upon this platform. They certainly crowd together for a start but soon spread out. The netting allows for a circulation of air and they experience no ill-effects. It is necessary to watch the chickens for the first few nights, but immediately they have settled down they can be left.

In erecting this platform it is essential to make it the full width of the house and at the closed end.

The thinning out of chickens as they develop must be practised. No hard and fast rule can be laid down as to when this thinning out should be practised as the work is dependent upon the space available.

With leghorns, if it is not intended to rear the cockerels for stud or table purposes, many could be disposed of at about three weeks of age. This will reduce costs and give the growing pullets more room. With all breeds it is desirable to separate the sexes as early as possible, and where males are to be grown for market purposes to place them under very intensive systems of housing, and to feed them with the object of obtaining the maximum growth in keeping with costs.

Young stock that do not appear to be thriving should be destroyed whether they be cockerels or pullets, as it is little use trying to make a satisfactory producer or table fowl out of an apparently unfit chicken.

TO SUBSCRIBERS—IMPORTANT.

Several subscriptions have been received recently under cover of unsigned letters. Obviously, in the circumstances, it is impossible to send the Journal to the subscribers concerned.

It is most important that every subscriber's name and address should be written plainly, preferably in block letters, in order to avoid mistakes in addresses and delay in despatch.

Marketing Oranges at Home and Abroad.

By JAS. H. GREGORY, Instructor in Fruit Packing.

PART I.

MARKETING oranges successfully at payable prices is now, through the tendency towards over-production in Australia, becoming an ever-increasing problem. Growers, in order to get the best prices for their fruit, should spare no effort in trying to attain the perfection of pack and "get-up" which will command top market prices. To do this it is necessary to take the utmost care in harvesting from the trees, and, when in the shed, in sizing and grading for quality; in the selection of the type of case and case timber; and finally in the labelling and stencilling. The fruit should be graded most carefully for quality.

Harvesting.

When the fruit appears to be ready for harvesting and sending to local markets, growers should make a test of a few specimens before finally deciding to pick. The test should show if the fruit will conform to the standards of maturity laid down in the Fruit and Vegetables Act administered by the Department of Agriculture and Stock, Queensland. If exporting overseas it is necessary to conform to the standards set by the Commonwealth Export Regulations, or if sending interstate to conform to the regulations of the State concerned. To make the test, specimens should be selected from trees in different parts of the grove, so that an average sample for the grove is obtained.

When the fruit is found to have matured, growers may go ahead with their harvesting. They should select only the largest sizes, for this allows for the packing of the most popular sizes, as well as ensures the highest standard of maturity. It has been found that large-sized fruit usually tests better for maturity than small-sized fruit. In picking it is usually better to make two clips—one to remove the fruit from the tree and a second to remove, if any, the surplus stalk. Gloves should be worn while handling the fruit to avoid finger-nail damage.

The best type of clipper is the blunt, parrot-nosed type. Picking bags, which are not recommended, if used, should be used with great care, as they are often a source of great damage to fruit when carelessly handled, causing stalk rubs, which add to the chance of mould infection. It will be found that baskets, or kerosene tins cut lengthwise and provided with handles or straps to place around the shoulders, are most satisfactory for harvesting. Fruit should never be tipped or rolled into the harvesting boxes. Care should be taken to see that in the cases or picking containers there are no projecting nails or pieces of wood that could cause damage to the fruit.

Whilst picking, a preliminary sorting or grading for quality should be made. This can be done by having the picking cases at central points in the orchard and grading the fruit into boxes as it is handled from the picking tins to the cases. Three grades should be made—i.e., "Special," "Standard," and "Factory."

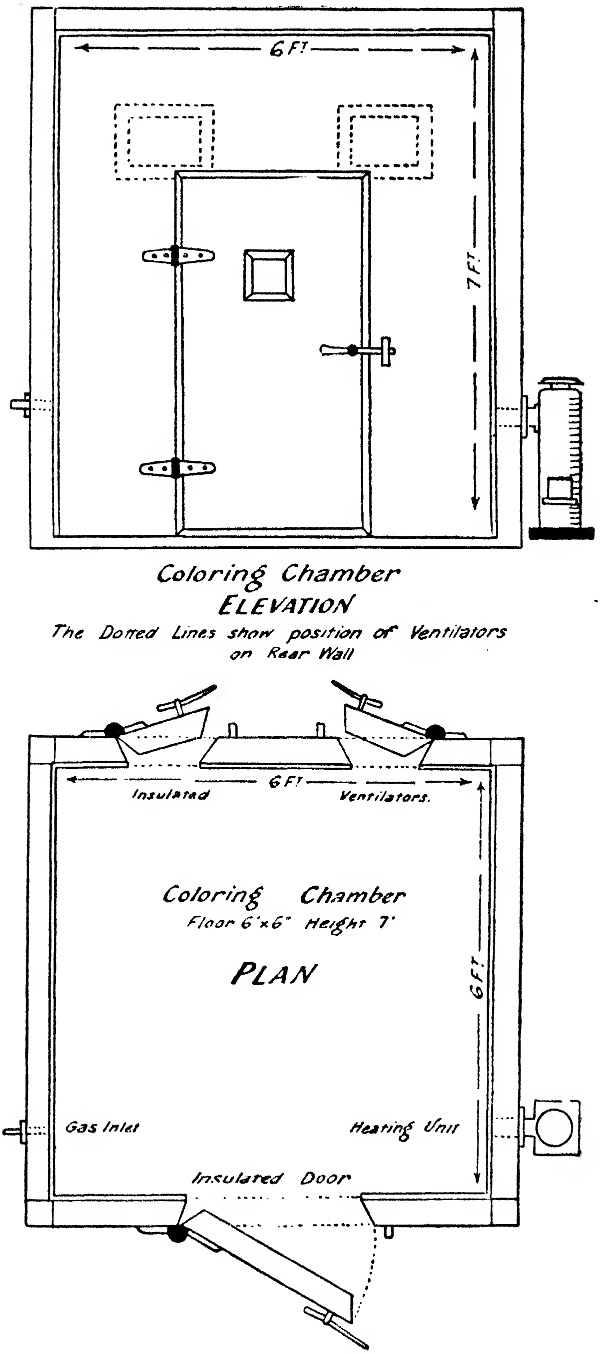


PLATE 158.

Plan and Elevation for Colouring Chamber.

Note.—The placing of the door with its inspection window and ventilators, which should be made as gas-tight as possible. Provision is also made for artificial heat and the application of the gas.

Colouring.

The appearance and value of fruit is enhanced by colouring. Only matured fruit will respond satisfactorily to the process of artificial colouring, immature fruit will not attain the rich colour so admired on the market. The Ethylene gas process has been found to give great satisfaction. Acetylene gas has also been used with success. It is necessary with both of these processes to have a gas-tight chamber to hold the fruit in whilst applying the gas.

Ethylene Gas Process.—Ethylene gas is procured in cylinders. The temperature for oranges during the colouring process is best kept at about 75 deg. Fahr.; this is different from lemons, which should be kept at 65 deg. The fruit is placed in a gas-tight chamber and the gas is injected, the quantity being one cubic foot of gas to each 1,000 cubic feet of space in the room. A gauge is attached to the cylinder for measuring the amount of gas for each application.

The best method of placing the fruit in the chambers is by using flat trays containing a single or double layer of fruit which will allow of free access of gas to the fruit. If these prove too expensive, growers can use cases which should be made on the flat and have the boards well spaced apart. The bottom layer of trays or cases should be placed on battens spaced on the floor of the chamber. It is recommended that the same cases be always used for the colouring process, as they can then be kept clean and free from fungus infection. Spraying the chamber and cases occasionally with a 1 in 20 solution of formalin will assist in eliminating infection from moulds. In applying the gas nothing is gained by using a larger quantity than is necessary. After the correct quantity of gas has been applied at the correct temperature, shut off the gas and allow the room to remain closed for at least four hours. The chamber should then be opened and the fruit completely ventilated to renew the oxygen. This needs to be done as quickly and completely as possible in order to keep the temperature of the fruit from changing in any marked degree. It is of advantage to allow the fruit to stand without gas for one or two hours before recharging the chamber. Two applications per day are sufficient. The same method of application is sufficient, nothing being gained by recharging sooner than four hours after the previous application of gas. Oranges properly coloured by this process have a greatly enhanced appearance. If oil sprays have been used on the trees it is advisable to use care in colouring, as the skin of the fruit is inclined to burn through chemical reaction.

Acetylene Gas Process.—The same type of gas chamber as used with Ethylene gas is necessary. The method of application is similar in most respects to the use of Ethylene. The correct quantity of carbide to use is determined by the size of the chamber. One ounce of carbide generates sufficient gas for 75 cubic feet of air. Experiments conducted by departmental officers in Queensland give the following table for general use:—

Size of Chamber.	Number of Bushel Cases.	Air Space When Stacked.	Dosage.
Cubic Feet.		Cubic Feet.	Oz. Carbide.
200	40	150	2
200	20	175	2⅓
200	10	187½	2½

A suitable container which permits the water to drip slowly on to the carbide should be used.

Nine to fifteen charges should give oranges a normal colour.

When using the Ethylene or Acetylene gas treatment with oranges the following points should be closely observed:—

Keep a temperature of approximately 75 deg. in the chamber.

Have fruit packed loosely in boxes or trays so that the gas has a free circulation around the fruit.

Stack the bottom layer on battens spaced along the floor of the chamber to permit a free passage of gas beneath the fruit.

Apply the correct quantity of gas according to the size of the room.

Allow the room to remain closed for at least four hours.

Open and ventilate the fruit as quickly as possible to renew oxygen.

Repeat the same process for further applications.

Remember that nothing is gained by overcharging or charging the chamber too often, so do not increase the cost by wasting gas in this way.

Care should be taken to keep all naked lights away from the room or gas cylinders when using the gas, as the mixture becomes dangerous when a large quantity of gas is mixed with air.

The following points must be strictly adhered to if the colouring process is to be of advantage to the industry.

Do not attempt to colour immature fruit, as it will not attain to a satisfactory product, being of a light and often dull colour which will not attract buyers.

Only perfectly dry fruit should be treated. Wet or damp fruit will scald severely and break down during transit to market.

Care must be taken that no oil or Bordeaux sprays remain on the fruit during treatment. Fruit not free of these sprays will become blotchy and unsightly during treatment.

Bruised areas on oranges will not colour properly.

All damaged fruit should be eliminated before colouring.

Remember artificial colouring will not increase the sugar content of oranges.

Building the Gas Chamber.

The building may be constructed of suitable timber, insulated and lined, or built of iron (which latter is hard, however, to make gas-tight). The process is done quicker and more efficiently with less waste if the chamber is made gas-tight. To make a gas-tight chamber, which means a large saving in the quantity of gas used, the space between the outside wall and lining boards should be insulated by filling with saw-dust, wood-shavings, charcoal, or other suitable material. This is also a big factor

in maintaining an even temperature. Paper-lining in addition to the filling is an additional improvement. In filling the cavity between the outside wall and the lining boards, trouble can be avoided by building the wall and lining at the same time and placing the filling in position as the wall is erected. As a sufficient supply of oxygen must be maintained in the room, it is necessary to change the air after every application of gas. To do this successfully ventilators should be placed at the opposite end of the room to the door. The door and ventilators (*see* Fig. 1), should be made as close-fitting as possible, and insulated in the same manner as the walls to obtain best results. By placing the ventilators at the opposite end to the door the air can be quickly changed in the room by opening both at the same time without causing any undue variation in temperature.

Temperature Control.

Heating to obtain the correct maximum temperature of 75 deg. Fahr. may be necessary in some climates, so provision should be made when building the gas chamber for the erection, where necessary, of a heating system. By building the room in a corner of the packing shed a more even temperature may be maintained, and in many parts of Queensland should make it unnecessary to install heating apparatus.

It should be remembered that, during warm periods, to help keep the temperature low, it is necessary to allow the fruit to cool before placing it in the chamber. A chamber 6 feet by 6 feet by 7 feet will hold fifty cases stacked loosely. Changeable climatic conditions will affect the humidity of the inside of the chamber. If the oranges show signs of withering during the colouring process, it will help to stop this withering if the humidity is increased by placing a dish of water or wet bags in the chamber. To avoid opening the chamber unnecessarily the thermometer should be placed in the chamber where it can be seen without opening the door. A small window built in the door will allow of easy observation of the thermometer and interior of the chamber.

Packing for Market.

Types of Cases.—Both the Australian Dump Case, internal dimensions 18 inches long by $8\frac{2}{3}$ inches wide by $14\frac{1}{4}$ inches deep, and the Canadian Standard Case, internal dimensions 18 inches long by $11\frac{1}{2}$ inches wide by $10\frac{1}{2}$ inches deep, are excellent containers. Both of these cases lend themselves admirably to the count system of packing. Such cases as the Long Bushel and other types of cases have not the same satisfactory features. Cases of the Long Bushel type do not permit of easy packing, being too narrow, causing skin damage to the fruit through rubbing on the side of the case whilst being placed in the bottom layers. The quantity of fruit touching the wood is also a source of increased damage through pressure and vibration whilst in transit. These cases, being narrow, do not lend themselves to standard-count packing, variation in the type of pack having to be used, making it practically impossible to have a definite system of standard counts for buyers. Most packs in cases of this description give the impression that the cases are only half-filled owing to the large number of packs with large spaces showing between the fruit. Buyers, seeing this and not knowing the number of fruit in the case, inevitably cut the price to safeguard themselves. Growers should insist on cases cut to the correct size and are well advised not to make up cases if the boards, when nailed

to the ends, have spaces between them of more than one-quarter of an inch. Spaces wider than this are often the cause of cutting the fruit on the side of the cases whilst in transit. It pays to use only a first grade milled case.

During visits to orchards many growers are found who do not make their cases correctly, thereby making it harder to do the standard packs required on the market. Another grave fault found is the bad milling of some of the boxes, causing the sacrifice of the essential features which make a particular type of box a success. A particular instance of this is the Standard box used for citrus fruits and apples. We often find that millers cut thick tops and bottoms for this box thereby precluding any chance of the packer putting a correct bulge in the case without damage to the fruit. The correct internal dimensions of each case will be given, together with a few remarks on the various features in the making up. I will not give the length and breadth of boards as these vary with the thickness of the ends of the case and the particular type of timber the case is milled from.

Australian Dump Case.

(18 inches long by 8⅜ inches wide by 14¼ inches deep.)

Thickness of ends—Minimum, ¾ inch.

Thickness of sides—Minimum, 5-16 inch.

Thickness of lid and bottom: ¼ inch exact.

Use 1¼ inch nails for sides, 1½ inch for tops and bottoms.

Canadian Standard Case.

(18 inches long by 11½ inches wide by 10½ inches deep.)

Thickness of ends—Minimum, ¾ inch.

Thickness of sides—Minimum, 5-16 inch.

Thickness of tops and bottoms—Maximum, 3-16 inch.

Dimensions of cleats: 11½ inches long by ¾ inch wide by 3-16 inch minimum thickness.

This case is made up with thin tops and bottoms to permit of a bulge of 1 inch to 1½ inches in height to be placed on the top and bottom of the case; the thin timber permits this bulge without damage to the fruit. The cleats are used to be placed across the ends of the lids and bottoms (see Plate 159) to strengthen the thin boards and assist in the prevention of splitting. The thick sides are necessary as all cases are stacked on their sides when in transit.

Use 1¼-inch nails for sides and 1½-inch nails for tops and bottoms.

The cleats (A.) are placed across the ends of the pieces of timber used for the tops and bottoms of the case and are not used in the position indicated by the dotted lines (B. and C.). If growers are supplied with a case with two-piece ends it is suggested that corrugated fasteners (D. and E.) be used instead of the cleats (B.) indicated. Two fasteners (D.) to join the two pieces should be placed on one side of the end about 1 inch from either edge, and one fastener (E) in the middle on the opposite side of the end.

Californian Citrus Box.

(24 inches long by 11½ inches wide by 11½ inches deep with partition.)

Ends and partition—Minimum thickness, ¾ inch.

Sides and bottoms—Minimum thickness, 5-16 inch.

Top—¼ inch thick with cleats attached as on the Standard box.

Cleats—11½ inches long by ¾ inch wide by 3-16 inch, minimum thickness.

Use 1½-inch nails for making and nailing.

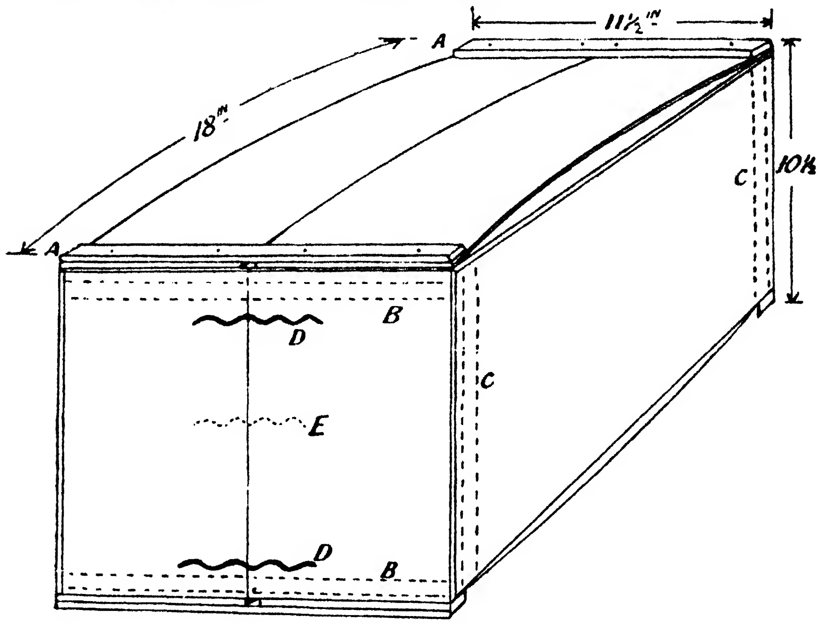


PLATE 159.

Sketch of Canadian Standard Case.

Grading.

As previously mentioned, three grades are recommended:—

"Special," consisting of sound, mature, unblemished fruit of even colour;

"Standard," consisting of sound, matured fruit not unduly marked by insects, fungus, or other injury, and matured fruit unblemished but of poor colour;

"Factory," consisting of blemished fruit free from disease or insect pests.

The operation of grading should be carried out during the whole period of handling the fruit. Whilst picking and when placing from the picking container into the orchard cases, the harvester should separate the "Special" from the "Standard" and "Factory" grades. By doing this "Special" and "Standard" are contained in separate boxes ready for the colouring process. After colouring and whilst transferring the coloured "Special" grade fruit on to the sizing machine a further sorting should be made, any poorly-coloured fruit or

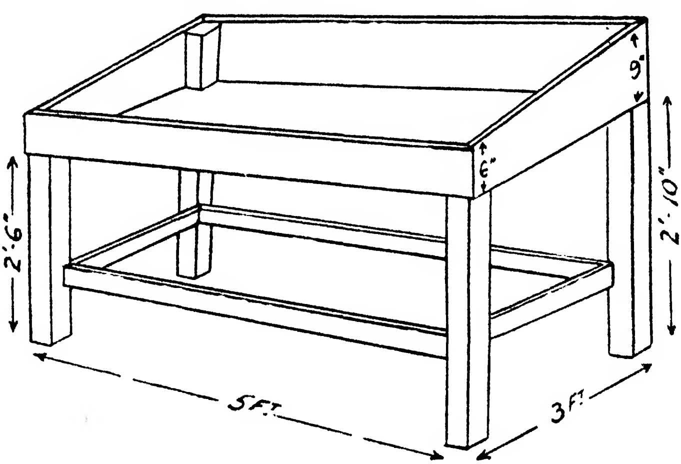
blemished specimens that may have been missed during the first sorting being removed and placed with the "Standard" grade. The same process can be used at this stage to separate "Standard" and "Factory" fruit.

Wrapping.

It is recommended that first grade oranges be wrapped. Wrapping is of great assistance in the safe carriage of oranges over long distances, thereby appealing to the country-order buyer. The wrapping of oranges isolates each individual fruit from the possibility of mould infection from its neighbour, so that in the event of one fruit becoming affected the wrapping paper is a means of preventing infection to the fruit next to it. When wrapping oranges the fruit should be placed in the wrapping-paper and the ends of the paper folded under and on to the cheek of the fruit, forming a pad on which the fruit is placed, and giving a very finished and neat appearance to the wrapped and packed layer.

Sizing.

Sizing the fruit before packing assists greatly in making packs easy to do and easy to bring to the correct height in the case, although there are packers who find no difficulty in packing unsized fruit by using a roomy bench (*see* Plate 160) to hold the fruit, tipping one case only



Fruit Bench to assist in Grading.

PLATE 160.

Fruit Bench to Hold Fruit whilst Packing.

Where there is no mechanical sizer this type of bench is very useful. Greatest efficiency is obtained when only one case at a time is tipped for packing. Please note that the bench is higher at the back than at the front, allowing the fruit to always be close at the packer's hand.

on the bench at a time. The packer then packs two different sizes at the same time, and, while packing, sorts the remaining sizes into separate heaps on the bench. Growers who are fortunate enough to have a mechanical sizer will find the operation of packing made easy provided that care is taken to avoid the pitfalls associated with mechanical sizers. Firstly, it should be remembered that in practically all mechanical sizing

machines two different counts of fruit can be packed from each bin, packing being made very easy if this rule is followed. To enable this to be done it is well to have packing stands of the type illustrated (*see* Plate 161). A spring board of the type illustrated is also helpful in preventing packers from getting aching backs, tired feet, &c.

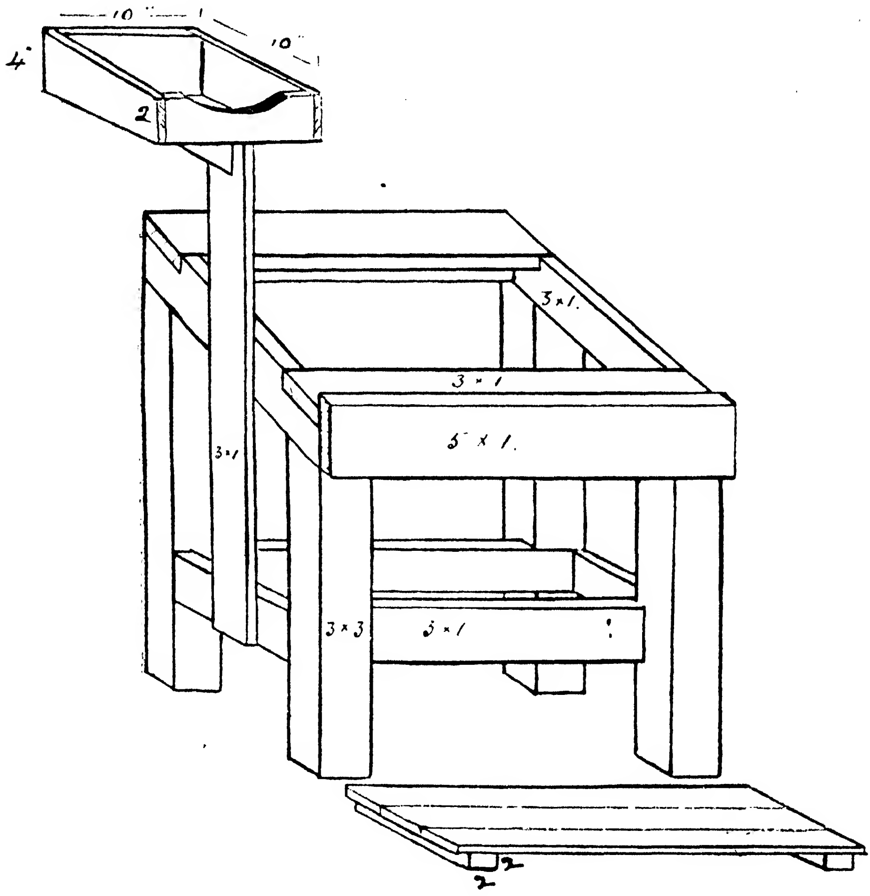


PLATE 161.

Packing Stand with Paper Holder and Spring Board.

This stand is tilted and holds two cases. The tilt assists the packer by keeping the oranges in position. The packer by packing two cases of different sizes at the same time is assisting himself in his sizing.

Fruit is always sized according to the measurement of its diameter, the following sizes being used:—2 inches, $2\frac{1}{4}$ inches, $2\frac{1}{2}$ inches, $2\frac{3}{4}$ inches, and 3 inches. Under the Fruit Act oranges are not allowed to be marketed in Queensland when under $2\frac{1}{4}$ inches in size. The size can be determined by having a set of rings made with these diameters, the orange being placed on the ring with the stalk up. Any orange that will fall through a $2\frac{1}{4}$-inch ring is classified as a 2-inch orange. Likewise, an orange that will go through a $2\frac{1}{2}$-inch ring and not through a $2\frac{1}{4}$-inch is classified as a $2\frac{1}{4}$-inch orange. This method is repeated to determine all sizes. A handy gauge can be cut from a piece of three-ply with a

washer-cutter or carpenter's expansion bit. A few weeks' experience will enable the packer to become so proficient that the use of the rings will become unnecessary. Packers are advised to always pack to a count instead of making up their minds that they will pack to an exact size. When using a mechanical sizing machine best results are obtained by keeping the rollers at a market setting so that the same counts can be packed out of each bin for any particular variety or shape of fruit. After any alteration of the rollers or belts to pack other fruits, the machine can be set back to its original place and the same counts packed from the same bins.

Packing.

The standard diagonal check system of packing is best. This pack has the following advantages:—

A given size of fruit will always come to the correct height in the case.

The packed fruit will always look attractive, appearing in straight lines, diagonally, across, and up and down the case, whether opened on the top, bottom, or sides.

No two oranges will rest upon the other, but in the pockets formed between the fruit of the layer beneath.

The height of the fruit in the case can be governed by making the pockets larger or smaller.

The quantity or number of fruit in the case is always the same for each pack, and can be ascertained at a glance.

It is my intention to, as far as is possible, simplify the packing. With this end in view readers will find that the various packs that can be used have been divided into two groups. One group contains a list of packs that will be found by most packers to be all that are necessary to pack all sizes of most types of fruit. The second group consists of intermediate packs which packers might find of use when different types of fruit, such as the Jaffa, occasionally do not come to the correct height in the case when using the packs of the first group. Growers should bear in mind that counts regularly used by the established packing houses are better understood by buyers, and should use these in preference to intermediate counts.

A fault often noticed in private packing sheds is the lack of any attempt on the part of packers to provide themselves with equipment to enable them to work fast and in comfort. Proper equipment in packing sheds soon pays for itself in increased efficiency, enabling a larger output per day to be handled. A pamphlet, "Packing Houses and their Equipment," describing how to make shed equipment, for a small cost, at home during the quiet periods of the year, can be obtained free on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

By using the packing stand illustrated (*see* Plate 161), the cases are slightly tilted, which helps to keep the fruit in position, thus making the packing much easier. The packer stands with the two cases to be packed into in front of him, with the fruit on one side of the cases and the wrapping paper on the other. The bench with the fruit on should be made tilted to permit the fruit to run to within easy reach of the packer.

The two cases used for citrus packing can be packed correctly by using four different packs. For the Standard box, 18 inches long by 11½ inches wide by 10½ inches deep, the 3—3, 3—2, and 2—2 packs will pack correctly all commercial sizes of fruit. When packing the Dump case the 3—2, 2—2, and 2—1 packs are used. A reference to the packing chart used in conjunction with a description of packs, will assist the beginner in understanding the difference between the different packs.

3—3 Pack.

This pack is only used in the Standard box and is very easy to do if care is taken in placing the first six oranges in the first layer. Three of these are placed in a layer across the end of the case with the stalks facing the end of the case nearest the packers, the first fruit being placed in the left-hand corner and the other two being spaced equal distances apart between the corner fruit and the right-hand side of the box. This leaves three even spaces between the fruit in which we place the next three oranges, forming the 3—3 from which the pack gets its name. This is repeated until the layer is finished. Care must be taken to see that fruit is placed in straight lines. The layer is then completed by placing lines of three in the spaces between each line of fruit until

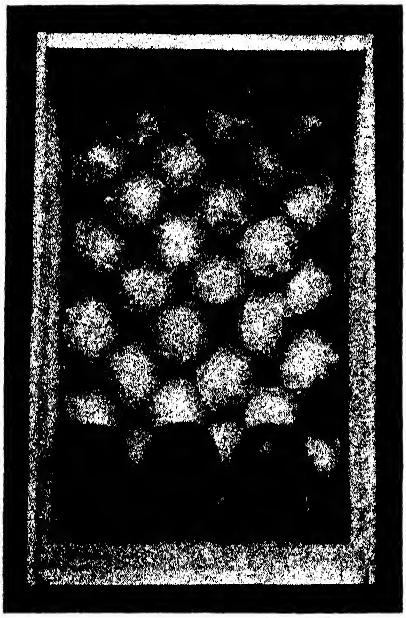


PLATE 162.

SECOND LAYER.

3-3 Pack.

The second layer is started by placing three oranges on the pockets between the first three fruit of the first layer. The layer is completed by placing fruit on the remaining pockets of the first layer.

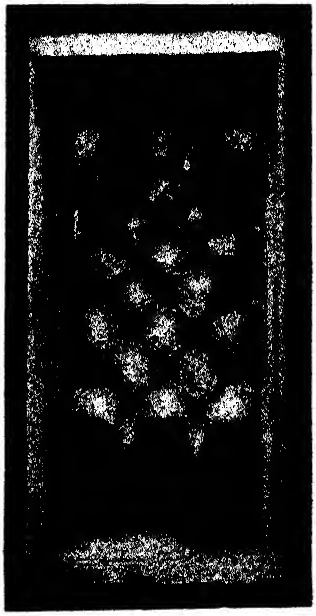


PLATE 163.

SECOND LAYER.

3-2 Pack.

The second layer is started by placing two oranges on the pockets between the first three fruit of the first layer. The layer is completed by placing fruit on the remaining pockets of the first layer.

the last line at the end of the layer is reached. The last three oranges are then placed in position but reversed so that the stalk end is facing the end of the box. The second layer is packed in the same manner as the first, but is placed in the pockets or spaces of the first layer (Plate 162). The same rule of placing the stalk end of the fruit to the wood applies in all of the packs.

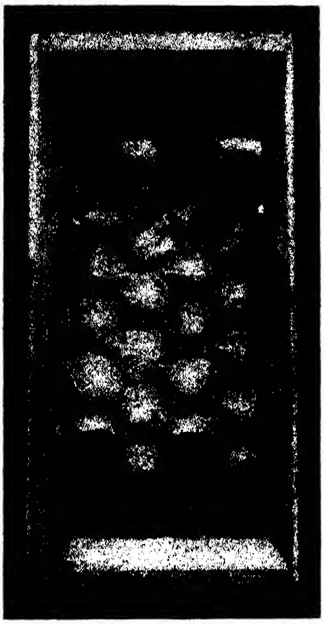


PLATE 164.

SECOND LAYER.

2-2 Pack.

The second layer is started by placing two oranges on the pockets between the first two fruit of the first layer. The layer is completed by placing fruit on the remaining pockets of the first layer.

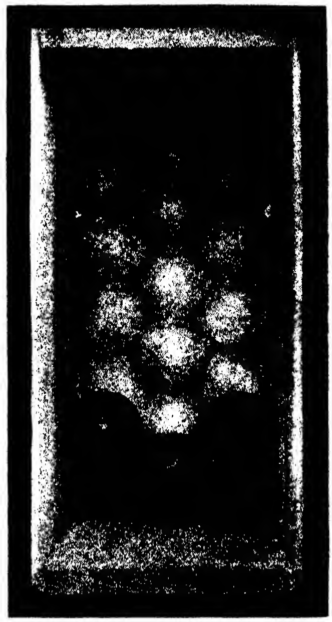


PLATE 165.

SECOND LAYER.

2-1 Pack.

The second layer is started by placing one orange on the pocket between the first two oranges of the first layer, finishing the layer by placing oranges on the remaining pockets.

3—2 Pack.

In the 3—2 pack the first layer is started by placing an orange in each corner of the case and one exactly midway between them facing end to end in the case, the stalks facing the packer. This forms a line of three oranges with two spaces, or pockets, between them. The pack is continued by placing two oranges in these spaces, which leaves three pockets between the two oranges. We repeat the placing of three oranges in these pockets, and then alternately two and three until the layer is finished, except for the last line of fruit; this is reversed with the stalks facing the wood of the case end furthest from the packer. To start the second layer (*see* Plate 163) place two oranges in the pockets formed by the first three oranges of the first layer, then two and three alternately, the stalks facing as in the first layer until all the pockets of the first layer are filled, again reversing the last line of fruit across the case. This process is repeated layer by layer until the case is filled.

2—2 Pack.

This pack is started by placing an orange in the bottom left-hand corner of the case and midway between this orange and the right side of the box a second orange, leaving two pockets between the two in which the next two oranges are placed, thus forming the 2—2 from which the pack derives its name. This is then repeated, the oranges being placed facing as in the 3—2 pack until the layer is finished with all but the last line of fruit. This is reversed with the stalks facing the wood of the case end furthest from the packer. The second layer is started by placing two oranges in the pockets formed by the first two of the first layer (*see* Plate 164), the layer being finally finished by placing oranges in all the pockets of the first layer and reversing the last line of fruit as in the first layer. By repeating this process layer by layer the case is finished. If close attention to the rule of starting the first layer in the left-hand corner is observed the number of layers in the case can be easily counted, the first, third, fifth, and seventh layers starting in the left-hand corner, and the second, fourth, and sixth layers starting in the right-hand corner. Knowing the number of layers there are in the case is of great assistance in separating counts such as the 96 and 112 in the Dump case, in which the layers look the same although the 112 contains one more layer than the 96.

2—1 Pack.

This pack is used only for the Australian Dump case. The same rule of placing the stalk end of the fruit to the wood applies. The pack is started by placing an orange in each corner of the case, which leaves a space between the fruit. A third orange is placed in this space or pocket, which gives us two and one from which the pack derives its name. The same process as with the other packs is then used to complete the layer. The second layer starts with one orange placed upon the pocket between the first two of the first layer (*see* Plate 165), followed by two, one, two, until the layer is finished. The case is completed by repeating further layers in the manner of the first and second layers, packing until full.

A close examination of the packing tables given will be of assistance. These will be dealt with separately for both cases. To simplify the packing as much as possible the packs will be divided into two sections for each case, one table giving the regular packs to use, the second giving the intermediate packs which can be used when the regular packs do not pack a given type of fruit satisfactorily.

Packing the Australian Dump Case.

The dimensions of the Australian Dump case are—18 inches long by 8¾ inches wide by 14¼ inches deep. The timber for this box should be cut with the sides of a minimum thickness of five-sixteenths of an inch, with the tops and bottoms a quarter of an inch thick. Unlike the Standard box, no cleats are used. The finished case should have a bulge of ½ inch to 1 inch on the top and bottom of the case when packed. Three packs are used to pack this box, the 2—1, 2—2, and 3—2.

TABLE A.

A Simplified List of Packing Counts to be Used for the Australian Dump Case.

Approximate Size.	Pack.	Layer Count.	No. of Layers.	Total.
2¼ inches	3—2	6—6	8	240
	3—2	6—5	8	220
	3—2	5—5	8	200
	2—2	7—7	7	196
2½ inches	2—2	7—6	7	182
	2—2	6—6	7	168
2¾ inches	2—2	6—5	7	154
	2—2	5—5	7	140
	2—2	5—4	7	126
3 inches	2—2	4—4	7	112
3¼ inches	2—2	4—4	6	96
	2—2	4—3	6	84
	2—1	5—5	5	75
3½ inches	2—1	5—4	5	68
	2—1	4—4	5	60
	2—1	4—3	5	53
4 inches	2—1	3—3	5	45

Try on all occasions to pack your fruit with these packs in preference to those in Table "D."

TABLE B.

Intermediate Packs to be Used for the Australian Dump Case.

It is recommended not to use these packs unless it is found that a type of fruit will not come to the correct height when any of the counts in Table "A" are used. On occasions when case ends are cut too wide it will possibly be found that one of these counts will assist to overcome the difficulty.

Approximate Size.	Pack.	Layer Count.	No. of Layers.	Total.
2¼ inches	2—2	8—7	7	210
2½ inches	3—2	6—5	7	193
	3—2	5—4	8	180
	3—2	5—5	7	175
	2—2	7—7	6	168
2¾ inches	3—2	5—4	7	158
	2—2	7—6	6	156
	2—2	6—6	6	144
	3—2	4—4	7	140
3 inches	3—2	4—4	6	120
	3—2	4—3	6	105
	2—1	5—5	6	90
3½ inches	2—1	5—4	6	81
	2—1	4—4	6	72
	2—1	4—3	6	63

Knowing the number of layers in a case at any stage of the packing is a good guide to a packer. By calculating the height the fruit will come to in the case two or three layers before the top is reached, the packer, by applying the rule, "The size of the pockets governs the

height of the fruit in the case," can bring the fruit either higher or lower as necessary. This is done by making the pockets smaller by slightly increasing the size of the fruit, and bringing the fruit higher in the box to correct a pack which will come too low, or, in the case of a pack that is coming high, to open the pockets by reducing slightly the size of the fruit. Usually these faults are caused by a variation in sizing the fruit in the subsequent layers after placing the first layer into position. Cases not of the correct width are often the cause of trouble in bringing to the correct height, but by following the rule governing the size of the pockets this difficulty may be overcome. It should be remembered that it is an offence against the Fruit and Vegetables Act to market fruit in under-sized cases.

Oranges packed in the Dump case should be packed 1 inch to 1½ inch above the top of the case, and when nailed have a bulge of ½ inch to 1 inch top and bottom.

[TO BE CONTINUED.]

NO OPEN SEASON FOR OPOSSUMS.

The Minister for Agriculture and Stock (Mr. F. W. Bulcock, M.L.A.) has announced the decision of the Government to continue the measures in force for the protection of the opossum in this State throughout the present year. This decision was arrived at after full consideration had been given to the various factors incidental to the opening of an opossum season.

For months past, said the Minister, his Department had been closely following developments in the oversea markets, which constituted a primary factor in any decision on the matter. In addition, reports were sought from departmental officials and other reliable sources of information as to whether the number of opossums in the breeding districts of the State was sufficient to justify trapping operations. The latest information available definitely indicates that opossums are not in sufficient numbers in the favoured districts to permit of legitimate trappers securing fair average supplies.

Information obtained as a result of inquiries on oversea marketing conditions shows that a total of approximately 1,520,000 opossum skins were catalogued and sold at the February and April sales held in London this year, and all Australasian supplies were practically cleared. Prices at the February sale showed a hardening tendency on the previous abnormally low averages of the past two or three years, but the figures for the April sale could not be classed as satisfactory, in that, although certain lines were sold at previous prices, a large proportion of the offering showed a distinct decline on figures for the February sale.

Taking the two primary factors into consideration, it is evident that an open season during the present year would not yield the trapper a reasonable return for his outlay and work. The Minister pointed out that although the Government was prepared to exploit every legitimate avenue for employment, it would be recognised that trappers should be afforded protection against operating under conditions which would be distinctly to their financial disadvantage at present.

In referring to the necessity for conserving the opossums in seasons when they are scarce in numbers, Mr. Bulcock emphasised the importance of the industry to the State when he pointed out that the value of the opossum skins obtained during the last four open seasons, aggregating only six months in the period since 1926, reached a total sum of almost £1,500,000.

Passion Fruit Culture in Queensland.

By H. BARNES, Director of Fruit Culture.

THE principal passion fruit grown commercially in Queensland is the common purple variety, *Passiflora edulis.* Other varieties have been tried from time to time, but have not proved sufficiently successful to warrant their general cultivation.

The passion vine is a climber and thrives best in the warm moist atmosphere of the tropics and sub-tropics. It requires constant attention by way of cultivation, pruning, and spraying for best results. It is a fact that the vines grow vigorously in our scrubs without care or attention and yield crops without trace of disease. When, however, the vines are domesticated, growing conditions are entirely altered. In the natural state the vines are isolated from any source of disease infection, and, further, their growth does not become as congested as it does when grown on a trellis. The production of dense masses of foliage is favourable to the development of diseases to which vines are so subject.

The usual features required to be taken into consideration when selecting a site for an orchard are also necessary when determining an ideal situation for growing passion fruit. Two of the main factors to consider are aspect and soil.

With regard to the aspect, a gentle slope to the east or north-east, sufficiently elevated to be above frost level and well sheltered from heavy winds, is best.

Good scrub or forest loams possessing good natural drainage will produce good crops. Comparatively poor soils will also grow good passion fruit if they are well drained and are systematically manured and kept well cultivated. Vines will not thrive in sour soil conditions. Stagnant water at the roots is fatal to them; for this reason it is not advisable to select very heavy soils.

Cropping Habit.

The passion vine bears its fruit on new growth. The time of first fruiting varies considerably, depending chiefly on the season of planting. As a general rule, however, when the vines are planted in the early spring, the first crop will be harvested in from twelve to fifteen months. When autumn planting is adopted the first profitable crop is generally borne the following summer twelve months, that is, eighteen to twenty-one months after planting.

As a rule two crops are borne yearly—a main summer crop and a secondary winter crop—though intermediate crops are at times obtained. Two to three months elapse from the time of the setting of the fruit to maturity. Under average conditions the vines flower during August, September, and October for the summer crop, which is harvested during November, December, and January. An intermediate flowering may occur about November or December, giving an autumn crop; whilst for the winter crop the vines flower during February and March and the crop is harvested during May, June, and July.

During particularly favourable growing years the vines may be in almost continuous growth, and consequently will ripen fruit practically all the year round; such, however, is not the general rule.

The profitable life of the vine is about four years when grown under proper cultural conditions. Maximum cropping is obtained with the second summer crop, following which the tendency is for the vines and the quality and appearance of the fruit to gradually deteriorate. Reasonably good crops can, however, still be obtained for another year or two.

Preparation of the Land.

Two much stress cannot be laid on the importance of thoroughly preparing the land prior to planting. The soil should be ploughed deeply and reduced to as nearly a perfect tilth as possible in order to provide the best soil conditions in which to grow the young plants. No amount of subsequent cultivation can make up any deficiency in preliminary preparation. Deep working makes a greater body of soil available from which the roots will be able to absorb plant foods, and also ensures better drainage.

Propagation.

Plants are easily raised from seeds or cuttings, though the former method is almost generally adopted and is recommended.

In connection with the selection of seed, it should be remembered that passion fruit are subject to several serious diseases (information concerning which can be obtained from the Chief Entomologist of the Department of Agriculture and Stock), and it is possible that these diseases can be transmitted per medium of the seed. Intending planters are therefore advised to obtain only perfectly formed fruits which have been allowed to mature fully on vigorous healthy vines. If the pulp is removed from the fruit and placed in a vessel of water for several days to ferment, the seeds may be easily separated from the mass. They should then be well washed in clean water and dried in the shade.

If early spring ripened fruits are selected and the seeds planted immediately, seedlings will be ready to plant out during the summer or autumn. If plants are required for spring planting (which period is preferable) seeds can be selected from fruit maturing in the late summer or autumn; if planted then seedlings will be available for planting the following spring.

The seeds should be sown in a specially prepared seed bed composed of light soil and leaf mould. They should be set half to three-quarters of an inch below the surface, and the soil should then be firmly pressed and subsequently mulched lightly with well-rotted manure. The bed should be sheltered from the sun and kept judiciously watered. In three to four weeks the young seedlings will appear, and as they develop they should be thinned out to about four inches apart, whilst the shade can be gradually removed.

Transplanting.

When the plants are about twelve inches high they may be planted out in the vineyard. Removal of the plants from the seed bed will be facilitated if the bed is given a thorough soaking before digging the plants; this will enable them to be lifted without excessive injury to the roots. Care should be exercised at all times when transplanting not

PLATE 166.— PASSION FRUIT VINE.
Showing fruiting habit.

to expose the roots to the sun and dry air which will quickly dry them out; keep them covered with damp sacking until they are ready to plant. If the tops of the plants have made excessive growth it is advisable to cut them back to about twelve to fifteen inches high in order to reduce evaporation of sap and avoid any tendency to wilt. Holes where the plants are to be set under the trellis should be dug in readiness. The soil round the roots should be well firmed and a quantity of water applied to each plant before the holes are completely filled in. If the weather is at all dry the plants may need to be given one or two further waterings at weekly intervals, following which ordinary cultural methods should fulfill all requirements.

Trellising and Planting.

Prior to planting the land should be marked off in rows about ten feet apart. The rows should run as nearly as possible north and south so that the plants may benefit from the sun's rays on both sides. If the vineyard is on a steep hillside, however, the contour of the land may play a considerable part in determining the direction of the rows. If the site selected is subject to washing during heavy rains the rows may be planted across the slope and provision made for contour drains to prevent as far as possible loss of surface soil by erosion.

Trellises consisting of good fencing posts should be erected along the rows, the posts being set 15 feet apart with their width across the row. Good sized posts are 8 inches wide by 3 inches thick by 7 feet 6 inches long; they should be set 18 inches in the ground, leaving 6 feet above the surface. The end posts should be much heavier, and should be well strutted and set 2 feet 6 inches deep, as they have to act as strainers and prevent the wires from sagging when they have to carry a heavy growth of vine. If the rows are very long it is advisable to have intermediate strainers about every 80 yards, or spreaders may be used to support the weight.

Two systems of wiring are in use, the first known as the parallel system in which two No. 8 galvanised wires are firmly fixed to the tops of the posts, one on each side, so that they form horizontal parallel lines about 8 inches apart, and the second known as the vertical system in which one wire is fixed to the top of the posts and the other placed about 15 to 18 inches below it. Each system has its advantages and disadvantages, but it is considered that the "parallel" system is the best for general adoption in this State.

If any grower favours the vertical system, four main leaders may be left, the first two being trained one each way on the lower wire and the remaining two on the top wire. One disadvantage of this system, however, is that, where growth is very vigorous, the laterals from the leaders on the top wire tend to smother the growth on the bottom wire and exclude the necessary light and air, thereby promoting the development of diseases. The system is probably better suited to vines grown on poorer land where the growth is not so vigorous and the foliage less dense.

The seedlings should be planted midway between the posts—*i.e.*, 15 feet apart. In two or three weeks following transplanting the vines will be in vigorous growth and will develop a number of laterals and shoots from around the crown of the plants at ground level. All should at first be allowed to grow until they are 18 to 24 inches long. The

PLATE 167.—PASSION FRUIT VINE.
Showing how the plants drag on the ground when grown on low trellis.

most vigorous growth should then be selected to form the future stem of the vine, and all the remaining shoots including the original stem should be cut away. The single stem selected should be tied to a light stake fixed firmly in the ground, and tied at intervals until it reaches the height of the trellis. The terminal bud should then be pinched out and two main leaders induced to develop. These are trained one each way along the wires until they reach the posts midway between the adjoining vines, when their further growth should be stopped by again pinching out the terminal buds. All branches developing from the main stem between the ground and the height of the trellis should be suppressed. Lateral branches will develop from the main leaders all along the wires, and these should be allowed to develop at intervals of about 9 inches. The laterals should be trained alternately over the two parallel wires and allowed to hang down. In this way the weight of the vine is distributed over the two wires. It is claimed at times that the vines give better results if trained only in one direction on the wires, but except in instances of rows planted up and down the slopes of hills (in which case it is found that the vines grow more vigorously up hill than down), the practice does not appear to have any advantage over the two-way system.

Pruning the Passion Vine.

Although there is no record that the pruning of the vine will increase its annual cropping capacity, it is nevertheless advisable to perform a certain amount of cutting back with the object of—firstly, keeping the vines healthy; secondly, inducing a growth of vigorous healthy wood on which good fruit will be borne; and thirdly, to bring in the crops at different periods of the year when better prices are realisable. The susceptibility of vines to certain diseases renders it necessary for them to be kept open to permit free penetration of light and air, and in order that they may be more effectively covered with preventative sprays.

It is never advisable to prune passion vines very severely. Vines so treated, if they survive, at times have a tendency to become shy-bearing. It is also important to remember that only very light thinning-out should be resorted to during dry weather.

It is a difficult matter to lay down in detail a set method of pruning, as each vine is likely to present a new problem which must be solved on the spot. Generally, however, all dead and diseased wood should be removed, long straggling laterals should be cut back to keep them clear of the ground, and where the growth has become dense and tangled the secondary laterals may be cut back to nine to twelve inches from the primary laterals which develop from the main leaders on the wires. All weak and spindly growths should be entirely removed, as such cannot produce good fruit. Pruning is a tedious work, but nevertheless it should be carefully done and every cut made with a definite purpose.

Most fruit trees are pruned during the winter time when growth is dormant, but as this is usually a dry period and, as has been mentioned previously, only light thinning is advisable at such times, the main pruning of passion vines is best carried out about the end of January and February after the main summer crop has been harvested. Rains are usual at this time of the year, which will assist the vines to put forward new growth for the second or winter crop, and the risk

of injury to the vines is not so great. Light pruning only should be done during a dry winter, the months of July and August generally being considered the best time.

The bulk of the main or summer crop of fruit is harvested during December and January, with the result that market prices at this time fall very low. Those growers who are particularly favoured by having the vineyard situated in a warm locality may take advantage of the fact that, provided the soil is well supplied with moisture, vines may be forced into growth at any time by pruning. If the vines are pruned earlier than usual for the summer crop they are likely to mature early fruit which will reap the benefit of the better prices obtaining before the main crop is harvested.

If the grower wishes to produce an extra big crop during the autumn or winter months, the summer crop must be sacrificed by pruning back the flowering secondary laterals to within nine to twelve inches. If a big summer crop is desired the winter crop must similarly be sacrificed.

Fertilizing.

The passion vine is a heavy feeder, and, whilst fertile virgin land may not need fertilizing for the first year or so, poorer soils should be fertilized from the outset. The Agricultural Chemist in his booklet "Complete Fertilizers for Farm and Orchard" recommends the following manure for passion fruit:—

"Use per acre, in accordance with the quality of the soil a mixture of—

1 to 2 cwt. nitrate of soda;
4 to 8 cwt. blood and bone manure;
1 to 2 cwt. superphosphate; and
1 to 2 cwt. sulphate of potash.

A top-dressing with 1 cwt. of nitrate of lime or nitrate of soda in spring will be found beneficial."

OTHER VARIETIES.

Passiflora laurifolia—"Bell Apple."

The Bell Apple is not grown to any extent in this State, though its fruit is quite edible. It is regarded more as a vigorous and handsome creeper than as a producer of fruit for market, and its cultivation for the latter purpose is not recommended. Without hand fertilizing it is prone to be shy-bearing.

Passiflora ligularis—"Mexican Passion Fruit."

This variety is of no use for commercial purposes as the pulp is absolutely without flavour.

Tacsonia mollisima—"Banana Passion Fruit."

The Banana Passion Fruit has been tried in this State, but the demand for the fruit is very poor, and it is consequently not worth growing. The matured fruit is elongated in shape, yellow in colour,

PLATE 168.—GRANADILLA PASSION VINE, TARINGA, NEAR BRISBANE.

and possesses a delicate skin. The flower is a pretty shade of pink and makes a splendid show when the vine is grown for ornamental purposes.

Passiflora macrocarpa—"Granadilla."

This variety of Granadilla can be grown practically anywhere on the coast of Queensland in warm situations. The fruit, as the name signifies, is very large, frequently weighing several pounds. The seed cavity is small for the size of the fruit, and is surrounded by a thick layer of whitish flesh of no particular flavour, but which, when flavoured with lemon, &c., may be used for pies. The plant is best grown on a lateral trellis.

Passiflora quadrangularis—"Granadilla."

This variety, which thrives in the tropical conditions of the North, is a smaller fruit than *P. macrocarpa* of a somewhat irregular oblong shape, about 4 to 4½ inches in diameter and 6 to 9 inches long. When fully ripe this is one of the most highly flavoured of all tropical fruits, and is much relished by those who know it. The cavity is large, and is filled with large seeds surrounded by a pale yellow pulp. Maturity is indicated by the softening of the flesh and the changing of the pale green colour to a dull yellowish green. Cultivation is similar to that of *Passiflora edulis,* and for preference the vine should be trained on an overhead trellis.

The Granadilla, when grown in Southern Queensland, often proves to be shy-bearing. The flowers are protandrous—i.e, the pollen of the anthers is ripe before the stigmas are ready to receive it. The pollen of younger blossoms is therefore necessary to fertilize the older flowers. Insects flying from one flower to another may carry the pollen with them and effect the required fertilization, but in the absence of insects hand pollination must be resorted to. A small camel-hair brush provides a ready medium for the transference of the pollen.

THE PREMIER'S MISSION TO GREAT BRITIAN.

THE Premier, Hon. W. Forgan Smith, remarked in the course of a message from London on the progress of his mission on behalf of Queensland producers that he had seen the British Minister of Agriculture (Right Hon. Walter Elliot), who advised him that the British Government had no intention of endeavouring to impose any quota on Australian dairy produce. Mr. Forgan Smith also has an assurance from the Imperial Authorities that no attempt to interfere with the preference on sugar would be made during the currency of the existing agreement, which still has about two years to run. He hoped to have further conversations on the subject before his departure from England on 7th July. The Premier went on to say that the British feeling towards Australia was marked and friendly, and the public generally held Australians in high regard. Queensland was favourably known, and he had been received kindly on every side.

Australian Nut.

By E. H. GURNEY, Agricultural Chemist.

DURING the past two or three years increased interest has been taken in the planting and cultivation in Queensland of the Australian Nut (*Macadamia ternifolia*). This nut was previously known under the name of Queensland Nut.

Therefore, it was thought that the publication of analyses, conducted in the Agricultural Laboratory of the Department of Agriculture and Stock, of a few samples of this nut, would be of interest and value for purpose of comparing any alteration that may occur in composition of the nut, due to introduction of any particular new strain or new cultural procedure.

The three analyses in the following table were made upon samples received in 1926, and were grown by Mr. J. F. Waldron, Upper Eungella, Tweed River, New South Wales. These analyses appear in the 1925-1926 annual report of the late J. C. Brünnich, Agricultural Chemist. It will be noted that No. 1 sample was not fully ripe and the kernel is shown to contain a very high moisture content. The green hulls of this sample were found to contain 4½ per cent. of tannin. The above-mentioned report contains the following statement:—

> "It will be noticed that, although the kernel of the thin-shelled variety is somewhat smaller than that of the ordinary variety, the percentage weight of the kernel is very much larger, so that 1 lb. of the thin-shelled nuts yields 6½ oz. of kernel, as against 4¼ oz. of kernel in 1 lb. of the ordinary variety."

——	No. 1. Thin-shelled Nuts with Hull rather Green.	No. 2. Thin-shelled, Hull Ripe.	Ordinary Variety with Hull Ripe.
Average weight of hull (grms.)	8·7	..	9·75
Average weight of nut (grms.)	8·2	7·8	14·8
Average weight of shell (grms.)	4·8	4·7	10·8
Per cent. shell	58·7	59·9	73·2
Average weight of kernel (grms.) ..	3·4	3·1	4·0
Per cent. kernel	41·3	40·1	26·8
Analysis of kernel—			
Moisture per cent.	28·2	6·1	11·8
Protein per cent.	8·9	8·7	8·6
Oil per cent.	52·8	72·7	70·0
Carbohydrates and fibre, per cent. ..	8·2	10·5	7·1
Ash, per cent.	1·9	2·0	2·5

The following table contains analyses of samples of the Australian Nut grown in Queensland in 1933. Sample No. 5030 was forwarded by Mr. J. Oxenford, Oxenford, and the other three samples, Nos. 949, 950, and 951, were grown by Mr. W. R. Petrie, Petrie. Each of these

samples of Mr. Petrie were picked from one tree only and all trees were grown on forest land without fertilizers.

—	VARIETY, LABORATORY NO., AND WHERE GROWN.						
	5030 Oxenford.	949 Petrie "Pearl."		950 Petrie "Planet."		951 Petrie "Red Windsor."	
Kernel	26·2%	42%		31%		32%	
Shell	73·8%	58%		69%		68%	
Average weight of kernel (grms.) ..	2·2	3·15		2·43		2·35	
Average weight of nut (grms.) ..	8·4	7·50		7·84		7·34	
	Kernel.	Kernel.	Shell.	Kernel.	Shell.	Kernel.	Shell.
	%	%	%	%	%	%	%
Moisture	5·1	3·01	10·39	2·92	10·73	3·01	10·98
Protein (N × 6·25)	7·4	7·13	1·66	8·885	1·75	10·11	1·66
Total Sugars ..	4·0	6·51	21·04	3·68	23·75	6·02	23·03
Other Carbohydrates by diff. ..	8·3	5·83		5·32		5·39	
Starch	Nil	Nil	..	Nil	..	Nil	..
Oil (Petrol Ether Extract) ..	71·4	73·68	0·28	75·44	0·32	73·04	0·32
Fibre	2·3	1·96	65·75	2·04	61·15	1·00	63·15
Ash	1·5	1·88	0·88	1·75	2·30	1·43	0.86
Containing—							
Lime (CaO) ..	0·11	0·44	0·12	0·16	0·15	0·19	0·13
Magnesia (MgO)	0·22	0·19	0·02	0·18	0·06	0·19	0·06
Potash (K_2O) ..	0·49	0·80	0·12	0·65	0·18	0·25	0·17
Phosphoric Acid (P_2O_5) ..	0·48	0·43	0·06	0·49	0·07	0·43	0·04
Refractive Index of Oil at 40°C. ..	..	1·4605		1·4605		1·4597	

The oil in each sample was clear, light in colour, and of pleasant odour.

The analysis of the hulls of sample 5030 is given below expressed as percentage of the hull.

	Per cent.
Moisture	17·7
Nitrogen	0·60
Ash	3·7
Lime (CaO)	0·17
Magnesia (MgO)	0·20
Potash (K_2O)	1·85
Phosphoric Acid (P_2O_5)	0·17

When extracting the kernel from the shell upon a commercial scale, there is a certain amount of the kernel left with the shell; therefore, to determine the composition of the screenings and sweepings of the broken shells, Mr. J. C. K. Sibbald, vice-president of the Australian Nut

Association, forwarded samples of such shell sweepings, and shell free from kernel. The analyses of these samples are given below.

—	Laboratory No.	
	1808	1809
	Screenings and Sweepings.	Shells.
	Per cent.	Per cent.
Oil	10·29	1·41
Nitrogen	·48	·28
Protein (Nitrogen × 6·25)	2·98	1·75
Ash	2·01	·95
Containing—		
Lime (CaO)	·36	·16
Phosphoric Acid (P_2O_5)	·34	·09
Potash (K_2O)	·14	·17

Land for Grazing Selection.

LANSDOWNE RESUMPTION.

PORTION 3, parish of Westbourne, Blackall Land Agent's District, comprising resumption from Lansdowne Holding, is situated about 80 miles south-easterly from Blackall, and comprises an area of about 21,640 acres. The portion will be opened at the Land Office, Blackall, on Thursday, 12th July, 1934, for Grazing Homestead Selection for a term of lease of twenty-eight years, and at an annual rental of threepence per acre for the first seven years of the term.

The portion consists of open, well-grassed Mitchell and blue grass country, lightly timbered, and is good wool-growing and fattening country. Water supplies are obtained from three tanks and the supply is sufficient. Other improvements comprise fencing.

The selection will require to be stocked to its reasonable carrying capacity with the applicant's own sheep within a period of three years, and proof must be furnished of the financial standing and pastoral or land experience of the applicants. The selection will be subject to a special condition that it be enclosed witth a rabbit-proof fence within three years from the issue of the license to occupy.

Free lithographs and full particulars may be obtained from the Land Agent, Blackall, the Land Settlement Inquiry Office, Brisbane, and the Government Intelligence and Tourist Bureaux, Sydney and Melbourne.

Agricultural Notes.

By H. S. HUNTER, Agricultural Branch.

WELL distributed autumn rains have assured a good winter in most of the agricultural areas. Grass is in abundance in the dairying country, especially near the coast, and these pleasant conditions should continue until heavy frosts harden the bite. Fodder crops are making excellent growth, and dairy farmers who found it possible to cultivate an ample acreage should have no need to worry about any shortage at the bucket while the cold weather is on.

Cereal Crops.

Beyond the Range the May rains came at an opportune time for the sowing of wheat and other winter-growing cereal crops. Grain growers now are very active sowing. The rains have induced a good growth of herbage, which will be of considerable value to the dairyman and sheep raiser.

Before last month's rains the early-planted wheat crops on the Downs could not be grazed owing to the risk of uprooting them, but these crops now are being grazed heavily. As a result of this feed being available there has been an increase in the output of dairy produce at most of the Downs factories, in contrast to the Lockyer and other inter-coastal districts, where the grazing of cultivation paddocks is not practised to the same extent.

The Cane Crop.

The sugar-cane crop in the far Northern areas did not show much progress during the past month; soil moisture conditions were favourable, but temperatures were relatively low. In the Burdekin area the crop continued to advance satisfactorily, but a continuance of dry weather has rendered irrigation necessary. The Mackay crop made slight progress under the dry and cool conditions experienced, while the crop in the southern areas improved steadily, due largely to favourable soil moisture. In all areas it is anticipated that arrowing of the crop will be heavy; many fields have already flowered, and such crops will, therefore, put on no further growth.

Crop estimates are now being made, and the projected yields for the 1934 crop will be available at an early date.

General Farming Outlook.

The dry weather of March was not without its compensations. Reports from the several centres on the Darling Downs and the Burnett and Moreton districts indicate that full advantage was taken of the conditions then obtaining to cure large quantities of excellent quality hay from the lucerne and Sudan grass crops.

The result is that many farms have good stocks of this valuable fodder stored for feeding to live stock during the winter, or as a set-off against a possible dry spell in the early spring. In these times fodder conserved on the farm is the more valuable because of the fact that most holdings are stocked to full capacity and, in some instances, above the margin of safety in an endeavour to offset low prices by increased production.

In the South Burnett district record quantities of lucerne hay have been made, and silos, which are reported to have remained empty for years, have been filled again. In addition, oats and barley have been planted extensively for winter feed.

The Central Burnett district is nearing the completion of one of the best and longest dairy seasons in its history, and the local butter factories have broken their previous records of output of dairy products. All stock are in excellent condition for the winter, feed is plentiful, and there is an abundance of stored fodder on the farms.

The remarks relating to Southern Queensland generally may be applied also to the central division. Live stock are in good condition for the winter, and the improved seasonal conditions have encouraged farmers to prepare fairly large areas for planting with wheat and winter fodder crops. Wheat is not grown extensively for grain production in the central division, although in the past crops in the Dululu and Theodore districts have yielded good quality grain when the seasons have favoured the crop.

Draught Horses in Demand.

Throughout the farming districts there is a keen demand for draught horses of good quality. This demand has existed for some considerable time, and as a result Clydesdale studs are being strengthened by the introduction of high-priced sires from the Southern States. Good quality working draughts, fillies, or geldings command up to more than £30 per head at the Toowoomba horse sales.

Business in Butter.

Since the Commonwealth Dairy Produce Act came into operation on 1st May, the wholesale home consumption price of butter in all States has been fixed at 140s. per cwt. This has provided welcome relief to producers in the Southern States, as the price, for the first time in many years, will be on a level with that operating in Queensland. This price during May will apply to only 45 per cent. of the Australian production, as an export quota of 55 per cent. has been fixed under the Act for that month. At the time of writing the wholesale price for Australian butter on the London market is in the vicinity of 70s. per cwt. The Australian Dairy Produce Export Control Board has decided that the existing 20 per cent. restriction on butter exports to the United Kingdom shall be discontinued.

BLOAT IN CATTLE.

A well known dairy farmer writes (28-4-34):—"One time in my heard of cows there were four cows that had to be taken to the yard about 4 p.m. nearly every day while the clover was good because they were blown. I had some sticks, with ropes attached, that were put in their mouths ready for them. The ropes were to go round the head to keep the sticks in place. As soon as the cows belched wind I knew they were safe. Since then I have found out that a chain is better than a stick, and it must be as loose as it can be but not loose enough for the cow to get it out of its mouth. I have never dosed a cow for this and never had to use a trocar and have not lost any by blowing on clover or lucerne."

LIST OF REGISTERED STALLIONS.

Subjoined is a list of stallions in respect of which Certificates of Registration were issued under *"The Stallions Registration Acts, 1923 to 1932,"* during the year 1933-34.

BLOOD STALLIONS CERTIFICATED FOR THE YEAR 1933-34.

Name.	Description.	Age.	Owner.
Addenda	Brown	3	G. Fogarty, Toowoomba
Amberheart	Bay	4	C. Phillott, care of A. G. Anderson, Hendra
Arboreal	Bay	3	M. Ryan, Ascot Chambers, Edward street, Brisbane
Armlie	Bay	4	W. R. Downing, Moolboolaman, Mount Perry Line
Arundel	Bay	5	P. Docherty, Merlin, Prairie
Bachelor's Echo	Bay	4	W. May, Clifton
Bachelor's Heir	Chestnut	3	K. Brennan, Boonah
Bachelor's Lodge	Bay	3	A. McAlpine, Cambooya
Bay Crystal	Bay	3	W. J. Langmore, Jondaryan
Black Guard	Brown	3	E. H. Mannion, West street, Rockhampton
Bob's March	Chestnut	Aged	J. W. Collins, Beaudesert
Boropolis	Bay or brown	3	P. J. Carroll, Newmarket street, Hendra
Brown Peter	Brown	3	Forest Vale Station, Mitchell
Byramjee	Brown	3	C. Bonham, care of C. O'Connell, Hendra
Centauri	Chestnut	4	F. E. Cobbold, care of A. G. Anderson, Hendra
Colloseum	Chestnut	3	W. Glasson, Umbiram
Dalmain	Bay	3	A. P. Gibson, Boolboonda
Dennis Lad	Chestnut	3	G. E. Crane, Elbow Valley, Warwick
El Joven	Bay	3	E. L. Ramsay, Cambooya
Exaltation	Brown	3	I. Freedman, Brunswick street, New Farm
Flying Painter	Bay	3	W. T. Gillies, Cooyar
Forceona	Grey	3	R. J. Spence, Muttaburra
Grand Revel	Bay	Aged	E. W. Sauer, Gayndah
Gunborough	Black	3	T. Kidd, Windorah
Guy Fawkes	Chestnut	3	J. P. Walsh, Mount Perry
Happy Returns	Bay	3	E. W. Walker, Oakey
High Exchange	Bay	4	W. H. Reynolds, Winchester street, Hamilton
High Gain	Brown	3	White and Rees, Surat
High Score	Brown	3	W. H. Anderson, care of A. G. Anderson, Hendra
High Standard	Brown	4	J. W. Wallace, Doncaster street, Toowoomba
Jehad	Chestnut	3	W. G. Hein, James street, Howard
Jokulsa	Black	3	E. L. Ramsay, Cambooya
Kelloshiel	Bay	4	H. B. Rankin, Tiree, via Aramac
Kengoon	Bay	3	A. G. Anderson, Hendra
King Baralong	Bay	3	D. C. Cameron, Le Geyt street, Windsor
Kintrockat	Brown	4	E. L. Ramsay, Cambooya
Layman	Chestnut	3	J. Redman, Wondai
Leolita	Bay	3	T. Jennings, Greenmount
Mane Berd	Bay	3	Derlin and Tilley, Kalbar
Marco Day	Brown	3	W. H. Richards, Pelican, Chinchilla
Meleager	Brown	3	M. Ryan, Ascot Chambers, Edward street, Brisbane
Modestre II.	Brown	5	A. E. Charles, Warrington, Inglewood
Mr. Speaker	Bay	4	T. J. Brosnan and I. J. Moore, Hendra
Night Piper	Brown	4	L. R. Lay, Prince street, Ascot
Oregyn	Chestnut	4	A. Adie, Childers
Pantheism	Bay or brown	4	W. Mace, Torilla Station, *via* Rockhampton
Pat Clyde	Bay	4	A. R. Taylor, Cecil Plains
Poitrel's Will	Bay	3	R. Betts, Boonah
Prince Fox	Brown	4	W. Donovan, Belah, Inglewood
Quertol	Chestnut	Aged	D. Brennan, Jimboomba
Real Flyer	Brown	3	W. A. Tucker, Bowley street, Hendra
Rightaway	Brown	4	E. E. D. White, Charters Towers
Scotch Force	Bay	3	B. Wagner, care of Marylands, St. Lawrence
Seaforth	Chestnut	4	L. A. Mackenzie, Dingo
Sea Laddie	Bay	3	J. Cunningham, Furmiston, *via* Warra
Serewick	Brown	3	T. J. Campbell, Kolonga, Gin Gin
Sir Bluewin	Brown	3	M. Brosnan, Dragon street, Warwick
Soft Step	Brown	3	W. J. Tucker, Bowley street, Hendra
Southern Don	Chestnut	3	D. A. Proctor, Glen Valley, Byrnestown
Spearall	Brown	5	P. J. Mayne, Forest Park, Warwick
Star Deer	Dark-bay	4	W. J. Noud, Kent street, Hamilton
Strange Idea	Dark-chestnut	4	A. G. Anderson, Hendra
Syce Lad	Bay	4	E. Wallace, Cania, *via* Monto
Warwick Eye	Black	3	G. Reinke, Minden
Windborough	Bay or Brown	3	W. B. Beal, Harriman Park, Cunnamulla
Wittabius	Chestnut	3	C. Bergmann, Witta
Wydells	Bay	Aged	J. E. Fox, Collinsville
Young Maloola	Brown	4	P. Jeppson, Paterson, N. C. L.

TROTTER STALLIONS CERTIFICATED FOR YEAR 1933-34.

Name.	Description.	Age.	Owner.
Bricklayer	Bay	3	Morrell Bros., Elphinstone
Broadarrow	Bay	4	F. T. Walker, Darriwell, *via* Bell
Broadcast	Brown	4	E. Rickerts, Walker street, Bundaberg
Cedarwood	Black	3	J. C. Schweikert, Yandilla
Gay Night	Brown	4	M. Robeck, Rockside, Gatton
Sir David	Bay	3	H. C. Gooding, Benowa, Southport
Vale Opera	Chestnut	3	L. T. Graham, Goomeri

PONY STALLIONS CERTIFICATED FOR YEAR 1933-34.

Name.	Description.	Age.	Owner.
Ding Dong	Bay	4	J. C. Mann, Pittsworth
Ebony	Black	4	E. Taylor, Fletcher
Eclipse	Taffy	4	M. J. Mullins, Goomburra
Guina	Chestnut	3	T. H. Welke, Kleinton
Little Mischief	Chestnut	3	R. Humphreys, Rosedale
Pento	Cream	4	A. Skyring, Kinbombi
Petite's Pride	Bay	4	A. O. Harm, Byee, Murgon
Sandy	Cream	4	J. Connors, Gundiah
Sir Pastel	Brown	3	D. R. Hutton, Cunningham
The Black Joke	Black	4	A. J. Salsbury, Duaringa
Tibby	Brown	4	H. Weigel, Hatton Vale
Tom Thumb	Chestnut	4	C. Donovan, Laidley
Young Guinea	Bay	3	H. H. Ehlrich, Douglas, *via* Goombungee

DRAUGHT STALLIONS CERTIFICATED FOR YEAR 1933-34.

Name.	Description.	Age.	Owner.
Banker	Bay	3	G. E. Bassingthwaite, Rosevale, Jandowae
Barney II.	Bay	4	W. Mow, Kurrumbul
Baron Favour	Bay	3	J. M. Newman, Caboolture
Baroona Musketeer	Chestnut	3	E. Mussing, Pomona
Bay Baronet	Bay	4	Mulholland Bros., Gympie
Beau Ideal	Bay	4	P. J. McCauley, Neurum
Belted Knight	Dark-bay	3	G. S. Miller, Upper Freestone
Ben	Bay	3	F. P. Alexander, Inveral, *via* Warra
Ben	Bay	3	V. Trott, Reid Creek, Gayndah
Ben Dale	Bay	3	R. E. McEwan, Cedar Creek, Pittsworth
Ben Hur	Black	3	R. C. Jefferies, Johnstown
Billy	Bay	3	H. Litherland, Beaudesert
Black Watch	Black	4	Fairymead Sugar Co., Bundaberg
Bob	Brown	4	A. Kunde, Kilcoy
Bold Boy	Bay	3	L. A. Armstrong, Rosewood
Bold Hero	Bay	3	G. Day, Grandchester
Boondandilla	Brown	4	C. Wright and Sons, Kindon, Goondiwindi
Bownce	Bay	3	W. H. Louttit, Windera
British Earl	Bay	3	P. G. Wilkie, Gayndah
Briton	Bay	4	R. Chandler, Forest Springs, Clifton
Captain	Bay	4	W. G. Rudd, Mudgeeraba
Captain	Brown	4	D. McCarroll, Murrumba
Captain Duke	Brown or black	3	F. Horne, Linville
Carlyle Prairie	Bay	3	T. W. Green, Jandowae
Chancellor	Bay	4	S. A. Plant, Trevanna, Cooyar
Charlie Boy	Bay	4	J. Wass, Rosewood
Clyde Prefect	Bay	3	J. S. Love, Townsville
Colonel	Bay	3	H. W. Zieball, Dalkeith, Mount Tyson
Crystal Boy	Bay	3	S. Webster, Kilcoy
Crystal Duke	Bay	3	J. Kennedy, Kumbia
Don Robin	Bay	3	W. F. Peters, North Maclagan
Double Top	Bay	Aged	C. J. Nielson, Yangan (Provisional)
Duke	Bay	4	A. Kahker, Gahan
Duke Dale	Brown	3	G. Tillack, Hatton Vale
Duke of Invermay	Bay	3	W. Richardson, Clifton
Duke of Sunnyside	Bay	4	W. F. Burge, Gomoran, Goombungee
Edgecombe Prince	Bay	3	J. W. Ritter, Mount Tyson
Farmer's Glory	Bay	3	F. Abraham, Lark Hill, *via* Walloon
Firedale	Bay	3	Fairymead Sugar Co., Bundaberg
Gindie Boy	Chestnut	4	G. L. Opperman, Ormeau
Gladfield	Black	3	P. W. Flynn, Redland, Clifton
Glen Dale	Bay	4	H. Truloff, Minden
Glenmore	Bay	4	F. P. Alexander, Inveral, *via* Warra
Heather Dale	Black	3	W. F. Whitney, Cowra
Hendon Bill	Brown	3	G. H. Clarke, Allora
Highland Boy	Bay	4	M. G. Topfer, Myury Villa, *via* Oakey
Highland Chief	Black	4	A. A. Treasure, Brigalow
Iron Duke	Grey	3	A. E. Missen, Clifton
Jondaryan Carlisle	Bay	3	H. J. Steinhardt, Marburg
Jondaryan McIntyre	Bay	3	J. Sprott, Ellenthorp
Jondaryan Wee Mac	Bay	3	W. B. Simpson, Hughenden
King Godfrey	Bay	4	J. W. Rush, Dulacca
Kingsford	Bay	Aged	W. P. Hyde, Nanango (Provisional)
King Wyllie	Chestnut	Aged	W. M. Hubbard, Chinchilla
Knight Abbit	Brown	4	P. G. Ruhle, Motley

DRAUGHT STALLIONS CERTIFICATED FOR YEAR 1933-34—*continued.*

Name.	Description.	Age.	Owner.
Lion	Bay	3	J. J. and D. W. Shine, Fernvale
Lion	Bay	4	A. Langton, Bunya Mountains, Dalby
Lochaber Lad	Bay	3	T. Laidler, Mundubbera
Lockyer Premier	Bay	3	C. Mahomet, Casino
Lord o' the Hills	Bay	4	E. Hindmarsh, Lyra, Stanthorpe
Lord Wallace	Bay	4	A. O. Harm, Byee
Lord Wheeler	Bay	3	C.Q.M.E. Co., Ltd., Lake's Creek
Major Wallace	Bay	4	Gross Bros., Campbell's Plains, Warwick
Monarch	Bay	4	J. C. Evans, Moola
Monarch	Brown	3	C. Head, Yangan
Newtown Baron	Bay	3	J. R. Anderson, Southbrook
Nobby's Pride	Bay	4	L. Ferguson, Nobby
Noble	Bay	3	J. W. Schultz, Coal Creek
Noble	Brown	3	R. G. Alexander, Inverai, *via* Warra
Orlato	Bay	4	C. Howe, Beebo
Patent	Brown	3	G. L. Opperman, Ormeau
Premier's Pride	Dark-brown	4	P. E. Muckert, Goomeri, Murgon
Prince	Bay	4	R. Williams, Kingaroy
Punch	Black	4	G. H. Fowler, Pittsworth
Punch	Brown	3	O. Reinke, Rosewood
Retaliator	Bay	3	T. J. Brosnan, Killarney
Rising Son	Bay	4	T. Dingle, Drummer's Creek
Royal	Bay	4	F. H. Hahn, Coulson
Royal Blue	Blue-grey	4	W. P. O'Sullivan, Ascot, *via* Greenmount
Royal Chance	Dapple-bay	4	W. J. Prosser, Kulpi
Royal Dale	Bay	4	O. P. Kanofski, Amberley
Royal Jock II.	Bay	4	R. W. and O. Kleinschmidt, Woongoolba
Royal Prince II.	Bay	3	G. S. Mant, Brooweena
Royal Prince	Bay	3	W. G. Bedgood, Crow's Nest
Sailor	Bay	3	E. M. Tong, Boynewood
Sergeant's Orphan	Brown	4	A. Kubler, Boonah
Shepherd's Pride	Bay	4	G. E. Crane, Elbow Valley, Warwick
Sheppard Prince	Bay	6	S. T. Evans, Chinchilla (Provisional)
Sir Douglas	Bay	4	Honey and Braithwaite, Murgon
Special Mac	Bay	3	W. J. Borchert and Son, Murgon
Square Dale Yet	Bay	4	A. Jansen, Swanfels, Warwick
Star	Blue-roan	3	W. Johnston, Strathpine
St. Helen's Bruce Dale	Bay	3	C. B. Baxley, Dalby
St. Helen's Lauder Dale	Bay	3	C. E. Lock, Back Plains, Clifton
St. Helen's Piper	Bay	4	S. A. Porrett, Flinders
St. Helen's Rob Roy	Bay	4	M. Gould, Yarraman
Studleith Premier Lad	Bay	3	G. P. Walker, junr., Helidon
Talgai Refiner	Black	3	H. C. Sprott, Ellenthorp
Talgai Wallace	Brown	4	W. Profke, Glamorgan Vale
The Intent II.	Bay	4	M. Gould, Neumgna
The Rajah	Brown	4	Jas. Love, Townsville
The Tent	Black	3	J. Love, Townsville
Tony	Bay	3	R. Bryce, Wootha
Wallace	Bay	3	G. Stanfield, Proston
Wallace	Bay	5	J. Braithwaite, Chinchilla (Provisional)
War Dale	Bay	3	F. G. Turner, Inverell
Wilga King	Bay	3	F. W. Goodall, Milmerran
Warawingeth Dignity	Bay	4	A. F. Creswick, St. Helen's, Pittsworth
Worthy Carlisle	Bay	3	J. Lehmann, Coolana, Rosewood
Worthy Craig	Bay	4	Wilson and Janson, Yandina
Young Baron's Pride	Bay	4	A. Hammond, Swan Creek
Young Kingsford	Bay	3	Scott Bros., Toogoolawah

BLOOD STALLIONS CERTIFICATED FOR LIFE DURING THE YEAR 1933-34.

Algiers	Bay	6	J. M. Newman, Caboolture
Ambercot	Chestnut	Aged	J. O. Kyffin, Acland
Amberwee	Bay	6	C. Hansen, College street, Ascot
Ante-Up	Dark-bay	5	W. Rankin, Toowoomba
Ardbern	Bay	6	R. G. L. Boxsell, Taylor street, Toowoomba
Auburn King	Chestnut	6	W. Feveriegel, Bald Hills
Ayr Nut	Chestnut	Aged	M. Muller, Wowan
Banistar	Brown	6	H. G. Young, Mount Stanley
Bevallas	Bay	Aged	H. V. Webster, Glenview, Berajondo
Black Apple	Black	5	P. L. Murray, Gunalda
Boebridge	Chestnut	Aged	J. W. Royan, Isis Central Mill, Childers
Bonnement	Bay	Aged	J. H. S. Barnes, Canning Downs, Warwick
Canonbie	Chestnut	Aged	T. Bishop, Rocky Glen, Cooyar
Carnival	Black	Aged	C. A. Barnard, Duaringa
Clever Laddie	Bay	5	R. G. Talbot, Ripplebrook, St. Lawrence
Clyde Scholar	Brown	6	G. Wilson, Yangan
Coondarra	Bay	5	C. Wright and Sons, Kindon, Goondiwindi
Corban, imp.	Bay	Aged	J. F. Jennings, Greenmount
Corban II.	Bay	5	M. Cavanagh, Hawkwood
Craftdancer	Chestnut	Aged	B. C. McNairn, Peachey

BLOOD STALLIONS CERTIFICATED FOR LIFE DURING THE YEAR 1933-34—*continued.*

Name.	Description.	Age.	Owner.
Daplin	Brown	6	J. C. Stockden, Cinnabar
Dear Sir	Bay	6	H. Spencely, Winton
Deerborough	Chestnut	Aged	A. H. Maguire, Kialla, Greenmount
Devonus	Brown	5	J. B. Shannon, Tooloombah
Dick Syce	Bay	Aged	T. Laidler, Mundubbera
Disclaim	Chestnut	Aged	J. B. Shannon, Tooloombah
Don Devas	Bay	Aged	J. M. Kennedy and Co., Wigton, Wondai
Emrix	Brown	5	E. K. Rideout, Mount Larcom
Friction Gun	Grey	5	T. J. Tobin, Daylsford
Gold Fern	Chestnut	Aged	J. J. Johns, Yeerongpilly
Grand Alliance	Bay	Aged	W. J. Lloyd, Harrow, Cambooya
Grey Tie	Bay	Aged	Walloon Pastoral Co., Walloon
Hebrus	Chestnut	Aged	J. P. Rodgers, Redfield, Talwood
High Airs	Brown	5	C. Lawton, care of A. G. Anderson, Hendra
Highland Nectar	Black	Aged	T. H. Murray, Rockhampton
Hop On	Brown	Aged	J. Wade, Gundiah
Hopover	Chestnut	Aged	H. J. Hyne, Maryborough
Hyron	Bay	6	P. Martin, Nudgee road, Hendra
Jo Jo	Bay	Aged	J. W. Sutherland, Inglewood
Kenilworth Mac	Chestnut	5	R. J. Barry, Jandowae
King Adorn	Bay	5	W. H. Kirk, Mundubbera
Kingspear	Brown	Aged	L. W. Fuymer, Silverspur
Laddie	Bay	5	C. Brooker, Swanfels
Listowel	Chestnut	Aged	J. H. Walker, Oakey
Lord Assam	Bay or Brown	Aged	Estate of C. A. Munro, Silverspur
Lord Leebius	Chestnut	Aged	J. Hunter, Yarraman
Lord Paddington	Bay	Aged	F. Beckmann, Plainview
Luigi	Chestnut	Aged	W. Gunn, Kildonan, Goondiwindi
Mat Syce	Bay	6	M. Kavanagh, Hawkwood, Mundubbera
McIntyre	Brown	5	H. B. Wilson, Covea, *via* Tingoora
Mecca	Bay	5	F. J. Watts, Yangan
Midwick	Chestnut	Aged	Scott McLeod, Inglewood
Minbar	Brown	5	W. J. Hampson, Cloyne, Goomeri
Mintnut	Bay	6	S. S. Webb, Neil street, Toowoomba
Monsildale	Brown	6	J. M. Kennedy, Villiers street, New Farm
Mote	Chestnut	Aged	Leonard and Sons, Welltown, Goondiwindi
Mr. Patience	Bay	5	C.Q.M.E. Co., Lake's Creek
Noble Deed	Chestnut	5	A. Pfingst, Glen Vale, Warwick
Noel Soldat	Bay	5	D. C. Cameron, Le Geyt street, Windsor
Nubian	Black	6	B. R. Lawless, Windera
Oatshell	Chestnut	Aged	C. Martin, Kumbarilla
Ocean Force	Bay	5	M. A. Gargett, Sandgate
Olive Steel	Chestnut	Aged	J. F. O'Sullivan, Wallaville
Omaga	Black	Aged	J. B. Shannon, Tooloomba
Opal Dean	Chestnut	Aged	M. McKenzie, Mooroondan
Pat Doolan	Bay	Aged	F. Jurgs, Cecil Plains
Pershay	Bay	Aged	Mrs. Bernicke, Pilton
Policastro	Chestnut	Aged	J. W. McKenzie, Dingo
Polmania	Bay	5	J. Docherty, Caraki, New South Wales
Prince Seremond	Brown	Aged	R. Hill, Unumgar, New South Wales
Ramazan	Chestnut	Aged	J. N. Lane, Pomona
Red Robin	Chestnut	Aged	W. H. Thrupp, Roma
Royal Foote	Bay	5	D. A. Wormwell, Meandarra
Royal Heather	Brown	Aged	McKenzie Bros., Alton Downs
Roysterer, imp.	Brown	Aged	T. J. Turkington, Wattlebrae, Pilton
Shell Shock	Chestnut	Aged	A. M. Cadell, Limevale
Shoulder Arms	Bay	5	Mary E. McGhee, Berajondo
Star Arrow	Chestnut	Aged	J. D. Stirrat, Mount Larcom
Sun Eagle	Brown	6	P. Reynolds, Richmond, New South Wales
The Buzzard, imp.	Bay	Aged	J. G. McDougall, Lyndhurst, Warwick
Tiny Mack	Chestnut	Aged	J. H. Truce, Brooklands, Kingaroy
Trent Simon	Chestnut	5	A. Perrett, junr., Elgin Vale
Tressador	Chestnut	6	C. Blume, Hamilton
Unumgar	Brown	Aged	J. V. Carrigan, Toobeah
Wayland Debs	Brown	5	J. Shanahan, Jane street, Ascot
Wise Force	Bay	Aged	D. W. McDougall, Dulacca West

TROTTER STALLIONS CERTIFICATED FOR LIFE DURING THE YEAR 1933-34

Belmont Prince	Bay	5	G. Klaasen, Scarborough
Burgy Bee	Bay	Aged	R. Crooks, Allora
Don Harum	Black	Aged	T. H. Crust, Esk
Dux Wilkes	Brown	Aged	A. Oelrichs, Mount Mee
Grand Opera	Bay	Aged	F. H. Ploch, Maryborough
Rex Delavan	Brown	Aged	R. Limberg, junr., Esk
Ribbon Bells	Dark-bay	5	F. Knecker, Bowen street, Annerley
Some Jewels	Brown	5	E. J. Wallin, Deception Bay
Woodhall	Bay	Aged	H. Wise, Kilcoy
Young Afghan	Brown	Aged	W. H. Lee, Nudgee

PONY STALLIONS CERTIFICATED FOR LIFE DURING THE YEAR 1933-34.

Name.	Description.	Age.	Owner.
All Black	Black	Aged	H. Klotz, Yandina
Auto Pay	Black	Aged	S. Russell, Chinchilla
Bennie	Chestnut	5	M. L. Horan, Inverlaw, Kingaroy
Billy Hughes	Chestnut	6	D. J. Wyllie, Canaga
Black Paddy	Black	Aged	D. P. McColm, Warwick
Blue Light	Bay	5	J. Russell, Lusitania street, East Ipswich
Comrade	Bay	Aged	F. L. Hampson, Cania
David	Grey	Aged	D. England, Gympie
Eclipse	Mouse	Aged	L. R. Martin, Kumbarilla
Faraam Mercury, imp.	Dapple-grey	Aged	J. M. Newman, Caboolture
Gold Fire	Chestnut	5	L. B. Evordell, Woodhill
Guinea	Chestnut	Aged	S. S. Webb, Neil street, Toowoomba
Japoon	Taffy	Aged	C.Q.M.E. Co., Lake's Creek
John Bull	Brown	5	H. G. Blair, junr., Harlin road, Ipswich
Little Dick	Taffy	Aged	O. W. Limberg, Esk
Little Don	Bay	6	C. Jose, New Moonta
Mac's Pride	Bay	5	S. H. Reynolds, Glasgow street, Toowoomba
Master Cupid	Black	5	J. Ryan, Stanthorpe
Mischief	Bay	Aged	W. Kruger, Jandowae
Mischief	Bay	Aged	A. Rae, Tirroan
Peter Pan	Chestnut-roan	5	C. M. Smith, Gatton
Play Boy	Black	5	J. Mullins, Mill Hill
Polo II.	Bay	5	F. G. Collins, Rosedale
Prince Michael	Taffy	Aged	T. R. Gordon, Kenilworth
Romulus	Light-chestnut	Aged	S. B. Trigger, Hopewell, Lakeside
Small Boy	Chestnut	Aged	R. McLean, Watalgan
Steele Rudd	Grey	Aged	A. G. A. Spencer, Glen View, *via* Yandina
The Hero	Bay	Aged	J. H. Atherton, Miva
Tim	Black	Aged	R. L. Boyd, Byrnestown
Tomboy	Brown	Aged	Mrs. E. T. Thompson, Calliope
Tom Thumb	Brown	Aged	E. H. Mann, Gooroolba
Uncle Mary	Dark-roan	Aged	L. Hughes, Childers
Victor Kelso	Brown	Aged	J. J. Tobin, Daylsford
Wee McKinney	Black	Aged	J. P. Ruhle, Motley, *via* Oakey
Young Wee McGregor	Black	Aged	W. J. Brazier, Jandowae

DRAUGHT STALLIONS CERTIFICATED FOR LIFE DURING THE YEAR 1933-34.

Name.	Description.	Age.	Owner.
Admiration	Bay	Aged	E. W. Genrich, East Cooyar
Again Champion	Black	Aged	J. Stenzel, Carney's Creek, Boonah
Ardlaw's Heir	Bay or brown	Aged	J. Sprott, Ellenthorp
Ballora	Bay	Aged	A. F. Hale, Eidsvold
Baronet	Brown	Aged	P. A. Todd, Biggenden
Baron Boy	Bay	Aged	G. H. Smith, Amamoor
Baron Bruce	Bay	5	S. Brown, Howard
Baron Sheriff	Bay	Aged	A. C. V. Bligh, Brookstead
Baron Wyllie	Bay	5	A. J. Edwards, Spring Valley, Kingaroy
Baron's Pride	Bay	Aged	C. B. Euler, Goomeri
Ben Alder	Bay	Aged	E. P. Campbell, Woombah, Mount Perry Line
Black Prince	Black	6	D. Stark, Anduramba
Bold Bill	Bay	5	J. Bowling, Coolabunia, Kingaroy
Bold Knight	Black	5	Fairymead Sugar Co., Bundaberg
Boree Fame	Brown	Aged	A. M. Cadell, Limevale
British Joy	Brown	Aged	J. P. Wormwell, Greenbank, Tara Line
Bruce	Bay or brown	Aged	Jas. Goodman, Stanwell
Bull	Bay	Aged	C. A. Munro Estate, Silver Spur
Captain Campbell	Bay	6	R. W. Henney, Symsdale, Bell
Chieftain	Grey	5	J. D. Stirrat, Mount Larcom
Chummy	Grey	5	J. McAulay, Hive Camp, Goomeri
Clyde	Bay	Aged	H. Rattey, Jandowae
Clyde Shepherd	Bay	Aged	J. V. Willis, Cooby Creek, Meringandan
Colonel of Kilbirnie	Bay	5	McFarlane Bros., Radford
Craigie Willie	Bay	Aged	A. Adie, Childers
Crystal Hope	Black	5	Galloway Plains Pastoral Co., Calliope
Crystal MacBride	Bay	5	H. A. Free, Ascot, *via* Greenmount
Crystal Spot	Bay	5	T. Clark, Nagoorin
Crystal Tom	Chestnut	Aged	J. F. Hubert, Mungar Junction
Crystale Vale	Chestnut	Aged	M. Betts, Guy street, Warwick
Darnley	Bay	Aged	J. L. Richards
Dew of Whitecliff	Grey	6	C. Anger, Duaringa
Donald	Grey	Aged	A. Ziebarth, Biloela
Duke	Bay	Aged	H. and F. Mason, Gurulmundi
Duke of Huntleigh	Chestnut	Aged	C. Ballin, Tallegalla
Dundonald III.	Black	Aged	Estate of J. Wason, Kilkivan
Endeavour	Bay	Aged	J. F. Hegarty, Silverwood, Brookstead
General Intent	Bay	5	J. T. Wade, Boompa
General Prince	Bay	Aged	H. Newton, Square Top, Bell Line
Gindie Majesty	Chestnut	Aged	H. G. Zipf, Norwell
Glencoe	Brown	Aged	W. Johnston, Kerry
Glen Dale	Black	6	H. Wetherspoon, Glenmore, Kulpi
Glenelg	Bay	6	J. Wade, Gundiah
Glengarry	Bay	5	Estate of late P. C. Anderson, Wondai
Glen King	Bay	6	W. Chard, Glengallen

DRAUGHT STALLIONS CERTIFICATED FOR LIFE DURING THE YEAR 1933-34—*continued.*

Name.	Description.	Age.	Owner.
Glenmore	Bay	Aged	E. J. Cross, Berajondo
Glenroy	Black	Aged	L. Dascombe, Newland, Haden
Glen Roy	Bay	Aged	C. Kiepe, Stockyard Creek, Helidon
Glory	Brown	Aged	N. Thornton, Rocky Creek, Milmerran
Hendon Hope	Bay	Aged	D. A. Proctor, Byrnestown
Highland Chief	Bay	Aged	J. D. Learmonth, Hill View, Pittsworth
Hillview Jock	Black	6	R. J. O'Brien, Pullen Vale
Hudson	Bay	6	W. J. Agnew, Elphinstone
Johnie Walker	Bay	Aged	M. Jensen, South Kolan
King Dale	Brown	5	E. C. H. Zillman, Hatton Vale, Laidley
King Tom	Bay	5	A. Pfingst, Glen Vale, Warwick
Kitchner	Brown	5	T. J. Coleman, Toogoolawah
Lord Robert	Bay	Aged	Turner and Munro, Wyaga, Goondiwindi
Loyal George	Bay	Aged	J. E. Lysaght, Maryvale
Majestic	Bay	Aged	S. B. Trigger, Hopewell, Lakeside
Major	Bay	6	St. Vincent's Orphanage, Nudgee
Major	Grey	Aged	A. E. Pechey, Pechey
Major	Bay	5	J. Sinclair, Glencoe, Eidsvold
Major Dale	Bay	5	D. J. Crowley, Crowley Vale
Major Dale	Bay	5	D. W. McDougall, Dulacca West, Jackson
McGregor	Bay	5	E. Frain, Miles
Nelson	Bay	Aged	A. J. Telford, Cambooya
Noble Prince	Dark-bay	6	R. Stark, Wondai
Pilot	Bay	Aged	J. H. Rogash, Goomeri
Ploughboy	Bay	Aged	W. E. Cockerill and Son, Boyne River, *via* Tingoora
Premier	Bay	Aged	A. F. Kerkow, Byee
Pride of Glen Cairn	Bay	Aged	E. G. Henderson, Sexton
Pride of the Mount	Bay or brown	Aged	S. G. Wagner, Kilcoy
Prince	Bay	Aged	D. Hinchcliffe, Yaamba
Prince	Dark-bay	Aged	Hunter Bros., Mount View, Cinnabar
Prince	Bay	Aged	W Stead, Cecil Plains
Prince Arthur	Bay	Aged	F. Prior, Wolca, Mount Perry Line
Prince Carlyle	Bay	Aged	A. Sippel, Redgate, Murgon
Prince Charles	Chestnut	Aged	J. Coss, Brigalow
Prince Dale	Brown	5	F. C. Manz, Lockrose
Prince Jelbyn	Bay	6	Walsh Bros., Beaudesert
Prince of Glenore	Brown	5	Ducat Bros., Tweed Heads
Prince of Springview	Bay	5	M. Dingwall, Gunnewin
Proston Lad	Bay	6	J. Bonsfield, care of J. Mitchell, Proston
Punch	Bay	Aged	H. Hill, Flaggy Rock
Punch	Brown	Aged	Margaret McGrath, Nankin Junction
Punch	Bay	6	P. Hunt, Warra
Renown	Bay	Aged	R. V. Breydon, Haden
Rising Heir	Bay	Aged	T. Dingle, Drummer's Creek
Robin Adair	Bay	Aged	M. C. Bishop, Glengowrie, Maidenwell
Royal Prince	Black	Aged	G. H. A. Koeler, Yamsion
Royal Robert	Bay	6	W. Donald, Booyal
Royal Scot	Bay	Aged	R. Humphreys, Rosedale
Ruben	Bay	5	E. I. Wallace, Fairview, Biloela
Scottish Hero	Roan	5	D. C. McWilliam, Alfalfa, Leyburn
Sir Garnet	Brown	Aged	J. H. Atherton, Miva
Sir William	Bay	Aged	B. Oberhardt, Pittsworth
Spark	Brown	5	R. M. Bell, Eskdale
Speewarmick	Bay	Aged	M. Muirhead, Pittsworth
Springmead Bright Laddie	Brown	Aged	W. A. Embrey, Tallegalla
Springside Trooper	Brown	Aged	R. E. Clay and Sons, Samson Vale
Talgai Leader	Dark-bay or brown	6	J. Sprott, junr., Ellenthorp
Talgai Pride	Bay	5	H. R. McIlveen, Giddi Giddi, Gooray
Tamar Mail Boy	Bay	5	A. Kubler, Boonah
Tiger	Bay	5	J. Tobin, Currajong
Vampire	Bay	Aged	F. A. Schelbach, Harrisville
Victory	Bay	Aged	H. E. M. Leggett, Gayndah
Wallace Lad	Bay	5	C. E. Morgan, Windera, *via* Murgon
Worthy Mac	Brown	Aged	Jondaryan Estate Co. of Australia, Ltd., Jondaryan
Wylie's Knight	Bay	Aged	E. Reinbott, Boolc
Young Grafter	Bay	Aged	M. F. Kirstenfeldt, Nutgrove, Cooyar Line
Young Prospector	Brown	5	L. A. Teske, Mount Beppo

List of stallions in respect of which Certificates of Registration were refused on account of either unsoundness or lack of type and/or conformation during the year 1933-1934. These horses are prohibited from service, either public or private.

BLOOD STALLIONS REJECTED DURING THE YEAR 1933-34.

Abbey Boy	Bay	4	H. O. Mischke, Veradilla
Alstar	Bay	Aged	W. J. Davey and Sons, Mimosa, Raglan
Araby	Light-bay	6	Messrs. Kessell and Worthington, Bororen
Barmoor	Brown	5	J. D. Lawless, Goomally, Duaringa
Black Spring	Brown	Aged	A. L. McDonald, Yaamba
Blue Monk	Grey	Aged	F. F. Doyle, Nogo River Junction, Ceratodus
Flying Fox	Bay	6	A. Kundy, Kilcoy
Gay Eiffle	Bay	4	W. Caldwell, Highlands, Bell

Blood Stallions Rejected during the Year 1933-34—*continued.*

Name.	Description.	Age.	Owner.
Gold Arm	Bay	6	P. Kerwick, Edward street, Dutton Park
Gold Mat	Chestnut	6	D. H. Proctor, Glen Valley, Byrnestown
Handsome Lad	Black	Aged	J. H. Blair, Harlin road, Ipswich
Hyman	Chestnut	Aged	H. Goodman, Stanwell
Jim Boy	Chestnut	Aged	C. S. Curtis, Tanby, Tungamull
Jimmy Jocks	Bay	Aged	W. Cadwallader, Swanson Park, Tungamull
Kelso	Brown	Aged	J. Ross, Eukey
Ladysal	Bay	Aged	H. Hancock, Killarney
Lancer	Bay	4	H. A. Burgess, Miriam Vale
Lord Ascot	Brown	Aged	J. Ward, Harrisville
Matterhorn	Chestnut	Aged	E. P. Itzstein, Hyde Park, Gooroolba
Mintoi	Bay	4	S. Schneider, Boonah
Monty	Chestnut	Aged	W. J. Park, Bli Bli P.O., *via* Nambour
My Gun	Black	4	C. O'Brien, Cabbage Tree, Ipswich
Narell	Chestnut	4	M. Coonan, Pittsworth
North Kerman	Bay	3	A. J. Lubke, Glamorganvale
Painter Russe	Bay	Aged	Mrs. Breydon, Haden
Persse's Promise	Chestnut	5	P. Ryan, Viewland, Gatton
Peter Pan	Bay	3	A. A. Young, Bristol Vale, Kinka
Peter the Silent	Chestnut	3	W. Pholi, Coraki, New South Wales
Pi Laddie	Bay	Aged	J. H. Furney, Dingo
Robin Hood	Bay	4	A. A. Treasure, Brigalow
Rosselah	Bay	Aged	Mrs. C. L. Davey, Roundstone, Baralaba
Sycebius	Brown	Aged	C. W. Mills, Nerang
Serefugle	Chestnut	Aged	J. P. Wormwell, Greenbank, Kupunn
Syce Knight	Chestnut	Aged	W. Grieve, Brookstead
Tom Turpine	Chestnut	5	F. M. Postich, River road, Warra
Unnamed	Chestnut	Aged	A. G. Lawrie, Evergreen, Westwood
Unnamed	Brown	4	J. W. Irwin, Redcliffe, Baralaba
Unnamed	Bay	Aged	A. Dunlop, Esk
Unnamed	Brown	3	A. W. Lord, Mount Stanley, Linville
Viceroy	Chestnut	6	H. G. F. Schneider, Mountain View, St. Lawrence
Wee General	Brown or black	Aged	J. Nolan, Baralaba
Welcome	Brown	Aged	R. Gross, Raglan
Winallan	Chestnut	4	D. M. Hay, Barmundu, Gladstone

Trotters Rejected during the Year 1933-34.

Comodore	Bay	4	J. W. Weedon, Biddeston
Prince Rapid	Bay or Brown	Aged	E. P. Macmillan, The Grange, Silkstone
Sheik	Chestnut	Aged	W. Gonchee, Esk
Steel Raven	Grey	5	R. A. Bowden, Pittsworth

Ponies Rejected during the Year 1933-34.

Joey	Black	4	D. Marschke, Bright View, Lowood
The Badger	Brown	5	W. J. Robinson, Esk
Unnamed	Brown	5	S. Dagg, Killarney
Unnamed	Brown	Aged	W. D. Draper, Duaringa
Windy	Bay	4	L. Lindenmayer, Milmerran

Draughts Rejected during the Year 1933-34.

Abbott	Brown	Aged	J. Barbour, Glen Ken, *via* Esk
Ball	Bay	6	P. J. Maynes, Forest Park, Warwick
Bally	Bay	Aged	H. Williams, The Glen, Kingaroy
Barney	Bay	Aged	B. C. Cross, Drayton Park, Inglewood
Baron	Bay	6	G. W. Morgan, Childers
Baron Duke	Bay	Aged	A. L. Parkinson, Upper Koondaii, Bell
Baron Prince	Bay	4	Inglewood
Bellevue Harry	Bay	Aged	T. W. Caldicott, junr., Bellevue, Yandilla
Blaze	Brown	Aged	Dippelsman Bros., Allan, *via* Warwick
Blaze	Black	Aged	W. Christenson, Pacific View, Bororen
Blossom's Son	Brown	Aged	J. A. Kelly, Mount Crosby
Blue Speck	Grey	4	J. Childs, Bouldercombe
Bluff Wylie	Bay	3	M. Carlson, Lanefield
Bob	Brown	Aged	F. Maurer, Darra
Bounce	Bay	Aged	J. Peters, Esk
Boxer	Bay	Aged	D. W. Nolan, Roslyn Orchard, Burrum
Braw Laddie	Bay	Aged	D. M. Nielson, Gin Gin
British Lion	Bay	Aged	J. Mullins, Mill Hill
Bruce	Chestnut	5	W. R. Gordon, Gayndah
Captain	Bay	6	W. Draper, Duaringa
Captain Connor	Chestnut	3	Pomona
Charlie	Brown	6	W. Webber, Glen Eagle
Charlie	Bay	4	J. Ryan, Clifton
Cheeky	Bay	Aged	J. D. Bond, Wheatlands, Wondai
Chris	Bay	6	N. P. Dahl, and Sons, Cedars, Bororen
Craig Dale	Bay	6	T. Palmer, Greenmount
Crystal Clyde	Bay	4	C. J. Bradley, Quebec, Mundubbera

DRAUGHTS REJECTED DURING THE YEAR 1933-34—*continued.*

Name.	Description.	Age.	Owner.
Crystal Hero	Bay	4	J. D. Huston
Damsel's Star	Brown	Aged	C. J. Stack, Inglewood
Donald's Son	Brown	Aged	W. E. Webster, Sarum, Kingaroy
Don Pearce	Bay	3	C. J. Clarke, Royal Oak, Tiaro
Drummer	Brown	Aged	H. A. Buchbach, Yandaran
Duke	Brown	3	F. P. Stark, Wondai
Duke	Brown	Aged	J. W. Weedon, Giddeston, Oakey
Duke	Bay	4	M. J. Camac, Theodore
Duke of Argyle	Bay	Aged	G. Nicholls, Pratten
Dunure Dale	Bay or brown ..	Aged	C. A. Pitt, Boyland Station, Beaudesert
Farmer	Brown	6	F. Waclmer, Newington, *via* Jondaryan
General	Bay or brown ..	Aged	C. F. W. Beckmann, Mulgowie
General Touch	Bay	6	J. A. Collett, Pomona
Glancer II.	Brown	5	A. Krueger, Kalbar
Gret Stain	Grey	3	A. E. Rankin, Binbi, Duaringa
Grey Gown	Grey	Aged	J. O'Rourke, Greenmount
Hero	Bay	Aged	J. A. Carlson, Nikenbah
Ideal Ron	Bay	6	L. Wedemeyer, Eidsvold
Jack Wallace	Brown	Aged	A. H. Lowe, Boller, *via* Kandanga
Jem	Chestnut ..	6	F. J. Stone, Currajong Creek, *via* Tirroan
Jim	Bay	6	A. H. and E. M. Kelland, Wowan
Joe	Bay	Aged	R. Bushnell, Ideraway
John	Bay	4	J. D. Wilson, Calliope Station, Calliope
Leo	Bay	..	W. Ford, Biggenden
Major	Chestnut ..	3	H. Nothdurft, Claremont, Oakey
Major	Bay	5	H. F. Blank, Kilcoy
Mark	Bay	..	J. Wood, Mount Chalmers, Tungamull
Monty of Glen Ian ..	Brown	4	S. H. Gralow, Theodore
Moor's Luck	Bay	4	F. M. Postich, River road, Warra
Mount Pleasant Wallace	Black	6	W. B. McLaughlin, Harrisville
Noble	Bay	6	G. Elliott, Sliepner Junction
Noble	Bay	Aged	Inglewood, South Downs
Nugget	Chestnut ..	Aged	E. W. Hill, Hillview, Beaudesert
Ploughby	Bay or brown ..	Aged	R. A. Filton, Kerry
Pride	Bay	Aged	J. J. Kessler, Cambooya
Pride	Brown	3	F. Niethe, Mundubbera
Pride of Glenmore ..	Black	Aged	W. C. Lund, Penshurst, Grandchester
Prince	Black	Aged	Archer Bros., Gracemere
Prince	Bay	..	R. J. Jenkins, Miva
Prince Chamberlain ..	Bay	Aged	C. F. Schmid, Pialba
Prince Tom	Bay	4	P. F. Schuh, Mount Perry
Punch	Bay	..	J. McLellan, Baralaba
Punch	Brown	5	B. Bradley, Ballandean
Punch	Bay	5	A. J. F. Gerchoo, Boonah
Richmond	Brown	Aged	A. Hanson, Amberley
Robin	Bay	Aged	J. Relf, Boonah
Robin Hood	Bay or brown ..	6	L. J. Clegg, Pratten
Rover	Bay	5	A. J. Specht, Tahara, Wellcamp
Royal Rolls Royce ..	Brown	Aged	J. Hardy, Eukey
Scottish Hope	Bay	3	A. C. Lawson, Deborah, *via* Netherby
Sir Oliver	Bay	Aged	H. Hiscock, Lochiel, Mulgeldie
Sir McIvar	Bay	5	F. B. Cory, Vermont, Warwick
Skipper	Bay	..	O. G. Draper, Tabooba
Spec	Bay	Aged	J. Russell, Chinchilla
Special	Brown	Aged	E. Cooper, Pratten
The Victor	Bay	5	K. Carew and W. E. Ivear, Kingaroy
Tiger	Brown	Aged	J. Muir, Blackbutt
Toby	Bay	6	Kerr Bros., Warra
Tommy Burns II. ..	Bay	Aged	J. H. Elsebach, Gayndah
Torsdale	Bay	Aged	J. S. Fovold, Barmundu
Trooper	Bay	6	M. E. Young, Koolnga
Trooper Dale	Roan	5	W. E. Sauer, Gayndah
Uncle	Brown	6	V. Osborne, Cobba-da-mana
Unnamed	Bay	5	—. Doran, Maryborough
Unnamed	Bay	Aged	—. Birch, Murgon
Unnamed	Bay	4	P. S. Connor, Stanwell
Unnamed	Bay	3	J. B. Pennell, Kalbar
Unnamed	Brown	5	G. Launder, Toogoolawah
Valley's Pride	Bay	5	J. Batley, Charlwood, *via* Kalbar
Wallace	Bay	6	C. Emery, Fairview, Bororen
Wallace Monk	Bay	Aged	H. J. Stokes, Thornton, Laidley
Warroo	Brown	5	G. F. Goodrich, Warroo, *via* Inglewood
Young Barron	Bay	4	W. C. Weeks, Boonnenne, Kingaroy
Young Jim II.	Bay	Aged	E. Anderson, Gympie
Young Rich and Rare ..	Bay	Aged	A. A. Watts, Yelarbon
Young Southgate Carbineer	Chestnut ..	Aged	R. Bishop, Moore
Ziff	Bay	Aged	J. W. Watson, Gympie

AGRICULTURE ON THE AIR.

Radio Lectures on Rural Subjects.

Arrangements have been completed with the Australian Broadcasting Commission for the regular delivery of further radio lectures from Station 4QG, Brisbane, by officers of the Department of Agriculture and Stock.

On Tuesdays and Thursdays of each week, as from the 3rd July, 1934, a fifteen minutes' talk, commencing at 7.15 p.m., will be given on subjects of especial interest to farmers.

Following is the list of lectures for July, August, and September, 1934:—

SCHEDULE OF LECTURES.

BY OFFICERS OF THE DEPARTMENT OF AGRICULTURE AND STOCK, RADIO STATION 4QG, BRISBANE (AUSTRALIAN BROADCASTING COMMISSION).

Tuesday, 3rd July, 1934—"Results of Disease Resistance Trials with Cane Varieties." By A. F. Bell, Sugar Pathologist.

Thursday, 5th July, 1934—"Intensive Cane Cultivation and Costs of Production." By Dr. H. W. Kerr, Director, Bureau of Sugar Experiment Stations.

Tuesday, 10th July, 1934—"Preparing Pigs for Show." By L. A. Downey, Instructor in Pig Raising.

Thursday, 12th July, 1934—"The Principles and Practice of Pig Feeding. By L. A. Downey, Instructor in Pig Raising.

Tuesday, 17th July, 1934—"Plants Poisonous to Stock." By C. T. White, Government Botanist.

Thursday, 19th July, 1934—"Plants Poisonous to Stock." By C. T. White, Government Botanist.

Tuesday, 24th July, 1934—"A Ramble in Rural England and its Lessons." By J. F. F. Reid, Editor of Publications.

Thursday, 26th July, 1934—"An Excursion to Scotland—Livestock Studies." By J. F. F. Reid, Editor of Publications.

Tuesday, 31st July, 1934—"Queensland—A Fruitful Country." By J. F. F. Reid, Editor of Publications.

Thursday, 2nd August, 1934—"The Story of Butter and Cheese throughout the Ages." By O. St. J. Kent, B.Sc., Analyst.

Tuesday, 7th August, 1934—"The Packing and Preparation of Tomatoes for Market." By J. H. Gregory, Packing Instructor.

Thursday, 9th August, 1934—"The Avocado in Queensland and Elsewhere." By H. Barnes, Director of Fruit Culture.

Tuesday, 14th August, 1934—"Packing Shed Hygiene." By J. H. Gregory, Packing Instructor.

Thursday, 16th August, 1934—"The Importance of Citrus Bud Selection." By H. Barnes, Director of Fruit Culture.

Tuesday, 21st August, 1934—"Papaw Cultivation." By H. Barnes, Director of Fruit Culture.

Thursday, 23rd August, 1934—"The Pasteurisation of Milk and its Products." By O. St. J. Kent, B.Sc., Analyst.

Tuesday, 28th August, 1934—"Vitamins in Dairy Products." By O. St. J. Kent, B.Sc., Analyst.

Thursday, 30th August, 1934—"Factors Influencing the Amount of Fat in Milk." By O. St. J. Kent, B.Sc., Analyst.

Tuesday, 4th September, 1934—"Seasonal Farm Crops," Part I. By C. J. McKeon, Instructor in Agriculture.

Thursday, 6th September, 1934—"Seasonal Farm Crops," Part II. By C. J. McKeon, Instructor in Agriculture.

Tuesday, 11th September, 1934—"Seasonal Farm Crops," Part III. By C. J. McKeon, Instructor in Agriculture.

Thursday, 13th September, 1934—"The Tobacco Industry Protection Act of 1933." By H. S. Hunter.

Tuesday, 18th September, 1934—"Some Requirements of Plant Growth." By E. H. Gurney, Agricultural Chemist.

Thursday, 20th September, 1934—"Fertilizers and Manures." By E. H. Gurney, Agricultural Chemist.

Tuesday, 25th September, 1934—"Nutritive Value of Pasture." By E. H. Gurney, Agricultural Chemist.

Thursday, 27th September, 1934—"Mineral Ingredients in Stock Foods." By E. H. Gurney, Agricultural Chemist.

PRODUCTION RECORDING.

List of cows and heifers officially tested by officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Book of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production charts for which were compiled during the month of April, 1934 (273 days period unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (OVER 5 YEARS), STANDARD 350 LB.			
Kilbirnie Ethel 3rd	Macfarlane Bros., Radford	15,733·05	715·677	Mowbray of Darbalara
Diana 17th of Kelston	A. Frank, Boonah	15,950·2	687·803	First Warrior of the Cedars
Kilbirnie Viola 1st	Macfarlane Bros , Radford	13,252·4	561·656	Mowbray of Darbalara
Nancy 6th of the Retreat	D. Gierke and Sons, Helidon	12,741·17	557·457	Togo of Whiteoak
Rowdy III. (268 days)	G. Gwynne, Umbiram	11,088·6	484·87	Exchange of Balmoral
Trevor Hill Blossom	G. Gwynne, Umbiram	8,486·91	395·383	Prince of Braemar
Daisy II. of Trevor Hill	C. O'Sullivan, Greenmount	9,334·37	376·036	Prince of Braemar
	SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB.			
Fancy 4th of Blacklands (270 days)	A. M. Johnson, Gracemere	8,617·94	361·143	Governor of Blacklands
Phyllis 4th of Springdale	D. Gierke and Sons, Helidon	10,810·06	361 83	Lovely's Commodore of Burradale
	JUNIOR, 4 YEARS (UNDER 4½ YEARS), STANDARD 310 LB.			
Trevor Hill Princess 2nd	G. Gwynne, Umbiram	11,614·8	449·270	Prince of Braemar
Miss Royal 2nd of Blacklands (268 days)	A. M. Johnson, Gracemere	8,502·05	369·305	Governor of Blacklands
Handsome 13th of Rosenthal	S. Mitchell, Warwick	8,369·5	316·304	Dividend
	SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.			
Lovely of Trevor Hill	G. Gwynne, Umbiram	9,122·5	406·886	Illawarra II. of Mayfield
Ethel 5th of Kilbirnie	Macfarlane Bros., Radford	8,814·7	378·775	Mowbray 2nd of Kilbirnie
Jean 12th of Blacklands	A. Pickels, Wondai	8,000·3	327·301	Fussy's Monarch of Hillview

	JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.			
Kingsdale Tot 4th	A. A. King, Mooloolah	7,995·7	370·044	Diamond Boy of Burradale
Rose 7th of Oakvilla	H. Marquardt, Wondai	9,937·23	365·687	Champion's Monarch of Oakvilla
Charm II. of Brundah	J. A. Heading, Cloyna	9,737·83	341·332	Osiris of Greyleigh
Penrhos Jess	A. Sandilands, Wildash	6,310·0	290·209	Bonnie Charmer of Coral Brae
	SENIOR, 2 YEARS (OVER 2½ YEARS), STANDARD 250 LB.			
College Stately	Queensland Agricultural High School and College, Gatton	8,908 01	435·766	Premier of Hillview
Kilbirnie Bella 16th	Macfarlane Bros., Radford	8,482·5	367·501	Kilbirnie Kenilworth
Woodlyn Midget Mavis (269 days)	J. L. Lyndon, Worongary	8,851·6	355·315	Spanker of Glenrock
Lady May 2nd of Blacklands (266 days)	A. M. Johnson, Gracemere	9,619·02	333·671	Hugo of Blacklands
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.			
Rosenthal Trixie 15th	F. G. Lamkin, Kainkillenbun	9,056·97	371·917	Rosenthal Handsome's Boy
College Granny 3rd	Queensland Agricultural High School and College, Gatton	8,164·68	346·273	Fussy's Kitchener
	JERSEY.			
	MATURE COW (OVER 5 YEARS), STANDARD 350 LB.			
Pineview Jewel	J. Hunter and Sons, Borallon	8,403·81	549·913	Oxford Buttercup Noble
Kelvinside Lady Marguerite	J. R. Williams, Glencliff	7,903 2	379·704	Noble Clarence of Kelvinside
Trinity Lady Clare (272 days)	J. Sinnamon, Moggill	7,358·19	369·683	Trinity Governor
	SENIOR, 4 YEARS (OVER 4½ YEARS), STANDARD 330 LB.			
Ruth of Ipsley	J. A. Rudd, Yeerongpilly	7,358 75	430·916	Rheubin of Ipsley
	SENIOR, 3 YEARS (OVER 3½ YEARS), STANDARD 290 LB.			
Trecarne Rosella 4th	T. A. Petherick, Lockyer	9,628·06	568·249	Trinity Officer
Lottie of Calton	J. Collins, Tingoora	11,195 33	540·48	Prince Clair of Calton
	JUNIOR, 3 YEARS (UNDER 3½ YEARS), STANDARD 270 LB.			
Oxford Sister	M. J. Dunn, Laidley	6,356 23	310·891	Oxford Silvius
Glenmah Victor's Edna	F. A. Maher, Moggill	5,705·05	306·705	Retford Victor's Noble
Oxford Silver	M. J. Dunn, Laidley	4,851·75	270·061	Oxford Silvius
	JUNIOR, 2 YEARS (UNDER 2½ YEARS), STANDARD 230 LB.			
Oxford Joyful Maid	E. Burton and Sons, Wanora	7,282·98	433·938	Trinity Ambassador
Moya's Pride of Newhills	J. Nicol Robinson, Maleny	5,636 65	352·447	President of Brooklodge
Trinity Cremorne	J. Sinnamon, Moggill	4,348·22	241·669	Trinity Cromwell

Answers to Correspondents.

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. Cyril T. White, F.L.S.

Rattlepod. (*Crotalaria acicularis*) Glycine Pea. Tick Trefoil.

J.W.H. (Caboolture)—

We can find no records of the properties of *Crotalaria acicularis.* It is a common weed in the Philippines and the East Indies, but in these countries stock do not play an important part and records of plants poisonous to them are few and far between. However, several species of *Crotalaria* have been definitely proved by feeding tests, both in Australia and abroad, to be poisonous to stock, and under the circumstances it is as well to regard the plant with suspicion and to prefer its room to its company. In the East several species of *Crotalaria* are grown as green manure, and they are excellent for the purpose. Most of them are more poisonous in seed than at any other time, so if the plant is in cultivation, and it is at all practicable, at the present time it would be a good idea to plough it in.

The creeping or twining legume is *Glycine tabacina.* This is a very common legume in the average native mixed pasture in coastal Queensland, and should be quite an important constituent. We have not heard a common name applied to it, and generally simply refer to it as the Glycine Pea.

The more bushy, upright plant is *Desmodium polycarpum,* a species of Tick Trefoil. Like most of the genus it should be quite good fodder, especially in rather wet, low-lying situations where this particular species is often found. The genus is a very large one, some of the members being small creeping plants, others of a more upright shrubby growth as in the present case. The name Tick Trefoil arises from the fact that the pods break up into a number of pieces, each bearing a number of seeds. These attach themselves to the clothing, the hairs of animals, &c., and in this way the plant is spread from one place to another.

Galvanised Burr.

INQUIRER (Brisbane)—

So far as we have observed the Galvanised Burr starts seeding at a very early age and when only a few inches high. It is rather hard to tell when the seed is ripe, but generally speaking it is ripe when the spiny burrs are fairly hard. If the seed germinates with the spring rains somewhere about September, the seed is probably ripe towards the end of November or early part of December. About January the plant is one mass of ripe seeds and continues in this state right through the winter until the following spring. Regarding the grub that is eating the burr, we advise your sending a sample of it to Mr. R. Veitch, Chief Entomologist, Department of Agriculture and Stock, Brisbane. As you may have seen by the papers, the Minister for Agriculture and Stock, the Hon. Frank W. Bulcock, is very keenly interested in pests of Galvanised Burr and some other weeds.

Rattlepod; Cluster Clover.

R.H. (Pomona)—

(1) With the yellow flower—*Crotalaria incana,* a species of Rattlepod. The Crotalarias or Rattlepods are dangerous plants, and several of them both in Australia and abroad have been proved poisonous to stock. No feeding tests have been carried out with the particular one you send, but so far as we have observed stock rather avoid it. It is sometimes called Native Lucerne, but this name it not to be encouraged as it more correctly belongs to other plants which are quite good fodders.

(2) With small clusters of dark-pink flowers—*Trifolium glomeratum,* the Cluster Clover, an animal clover that comes up mostly in the autumn months, lasts through the winter, and dies out on the approach of the warm weather. Your specimen is rather unseasonable. It is quite a good fodder and is occasionally sown, though most frequently it comes up of its own accord on the edges of cultivations and similar places.

Bella Sombra Trees.

J.C.J.H. (Strathpine)—

The sample represents the Phytolacca or Bella Sombra tree (*Phytolacca dioica*), a very quick-growing tree. Sometimes it is planted for shade and green fodder for stock. Chemical analysis shows the leaves to have quite a high fodder value. In the days of ostrich farming in South Africa the tree was said to have been planted quite frequently as a fodder for ostriches. As regards the berries, we have seen fowls eat large quantities of them, particularly the dried ones under the trees, without any ill effects following. When the berries fall from the trees they are generally dried and shrivelled, and in such a form have rather a dry, sweetish taste something like currants or raisins.

Red Natal Grass.

J.S.P. (Nanango)—

The specimen is *Rhynchelytrum roseum*, Red Natal grass. This grass was imported into Queensland many years ago as a fodder, though its use in this respect seems to be quite limited. In Queensland it grows mostly along railway lines, in old cultivation lands, and is especially a weed of orchards in the coastal parts of the State. In such places it is used to a fair extent as a chop-chop for working horses, and farmers say it is quite good in this respect, especially if mixed with a little more palatable fodder.

Poison Peach.

N.I. (Collinsville)—

The particular specimen forwarded is the common so-called poison peach of Queensland and New South Wales (*Trema aspera*). The poisonous principle in this plant is a prussic-acid yielding glucoside somewhat similar to that found in Sorghum, occasionally in Sudan grass and other fodders. The occurrence of the glucoside in the plant is very transitory and what controls its formation is not known. It is certainly more often absent than present, and this accounts for the fact that stock frequently feed on Peach bush in very large quantities without any ill effects following whatever. We carried out some tests with this plant some years ago, and found that the poisonous principle was not confined to any one month. We got most positive results in February, but got positives again in May and June, but none in January and March. In June, as well as positive tests we got negative ones.

In reply to the query raised, although we do not known what controls the glucoside in this plant, it is more likely to be present in the young than in the old, and is most likely to be abundant if a cold snap quickly follows rank growing summer weather. Certainly the symptoms as described —a very rapid death and animals dying after drinking—seem to point to prussic-acid poisoning. As to the point raised as to why young stock should be effected more than old, we think young stock would certainly be more susceptible to the poisonous property of a plant of this type than older animals.

Tie Bush.

A.W.M. (Mount Nebo)—

Wickstroemia indica, Tie Bush, so called on account of the strong fibre contained in the bark. This plant has commonly been suspected of poisoning stock. Some few years ago leaves of it were fed to heifers at the Animal Health Station, Yeerongpilly. After about a fortnight's feeding the animals became very thin and emaciated and blood was passed with the dung, but on being put on to ordinary feed they recovered. About a year ago the berries were suspected of poisoning a child at Nambour. They were fed to guinea pigs and death resulted. On this account we think the plant should be destroyed.

Flannel Weed.

F.O'B. (Pullen Vale)—

The specimen is the Flannel Weed, *Sida cordifolia*, a very common weed in Northern Queensland. Of recent years it has spread to the more southern parts of the State. We do not think it has any fodder value, although it is not known to be poisonous or harmful in any way.

"Feather-top Rhodes Grass" (*Chloris Virgata*).

T.D. (Rywung)—

The specimen is *Chloris virgata*, commonly called the Feather-top Rhodes Grass. On the whole, so far as our experience goes, stock do not take to this plant although it has a green and luscious appearance. We have heard, however, that stock will eat it readily enough made into a form of hay, but on this point we have had no personal experience. The plant becomes a bad pest in cultivation, and has considerably decreased the yield of many of the lucerne fields in the Lockyer Valley. Where ordinary Rhodes Grass will generally thrive, we think its room is preferable to its company.

Native Trees Suitable for Park or Street.

A.H.B. (Nambour)—

"Australian Rain Forest Trees" may be obtained from Barker's Book Stores or any other Australian bookseller, and is published by the Council for Scientific and Industrial Research. Copies may be obtained direct from the local secretary, Council for Scientific and Industrial Research, corner Ann and Edward streets, Brisbane. The price is 10s.

Below is a list of native trees suitable for street and park planting. The list is, of course, by no manner of means complete, and is confined to trees that can be obtained either through the ordinary commercial channels or from Government and municipal nurseries, such as the Forestry Department or the Brisbane Botanic Gardens. If you visited the local scrubs you would find a number of seedlings of different trees that could be transplanted; or, failing seedlings, you could often get from the ground a number of seeds. These could be sown and afterwards pricked off into tubes or pots. I do not think you would find many unsuitable plants, because such a large number of the scrub trees make beautiful shapely specimens when grown in the open. Pittosporum (*Pittosporum undulatum*); Red Cedar (*Cedrela australis*)—Rather hard to grow on account of attacks of Cedar Twig Borer; White Cedar (*Melia dubia*)—Grown extensively, but berries are poisonous; Crow's Ash (*Flindersia australis*)—One of the handsomest of out native shade trees; Yellow Wood (*Flindersia Oxleyana*); Moreton Bay Chestnut or Bean Tree (*Castanospermum australe*)—Much grown as a street and park tree, but seeds are poisonous to live stock; Citron Scented Gum (*Eucalyptus citriodora*); Buckinghamia (*Buckinghamia celsissima*)—A native of North Queensland. There are some beautiful specimens in Queensland streets; Queensland Nut (*Macadamia ternifolia*); Flame Tree (*Sterculia acerifolia*); Wheel of Fire (*Stenocarpus sinuatus*)—A beautiful tree, but very slow grower; Queensland Beech (*Gmelina Leichhardtii*); Kauri Pine (*Agathis robusta*); Hoop Pine (*Araucaria Cunninghamii*); Cypress Pine (*Callitris columellaris*), or other species; Figs (*Ficus* sp.)—Some of the smaller leaved sorts are excellent, though their extensive root system is a drawback; Silky Oak (*Grevillea robusta*).

Guinea Grass—Suspected Poisoning.

F.T. (Charters Towers)—

The sudden death of the calves and the thorough-bred colt point rather to prussic-acid poisoning, and it seems possible that the Guinea grass has suddenly developed this poisonous property. Send some of your local Guinea grass to the Commonwealth Stock Experiment Station, Townsville, and ask if their chemist could make a test for the presence of a prussic-acid yielding glucoside. We recommend this course because it is preferable to test this grass when fresh, and by the time the specimen reached Brisbane it would either have become very dry or very mouldy. In either case, it would not be very satisfactory for examination for the presence of a prussic-acid yielding glucoside. At the same time we are getting samples of Guinea grass from a number of different localities around Brisbane for a similar examination. The matter brought up by you, needless to say, is a very important one, because Guinea grass is one of the commonest grasses in Queensland and is again coming very much into favour. Personally, we may say that so far as our experience goes stock are extremely fond of Guinea grass, and although we have seen much of it fed have never heard of any trouble before. If we cannot find a poisonous principle in the Guinea grass, the cause of the trouble must be looked for elsewhere.

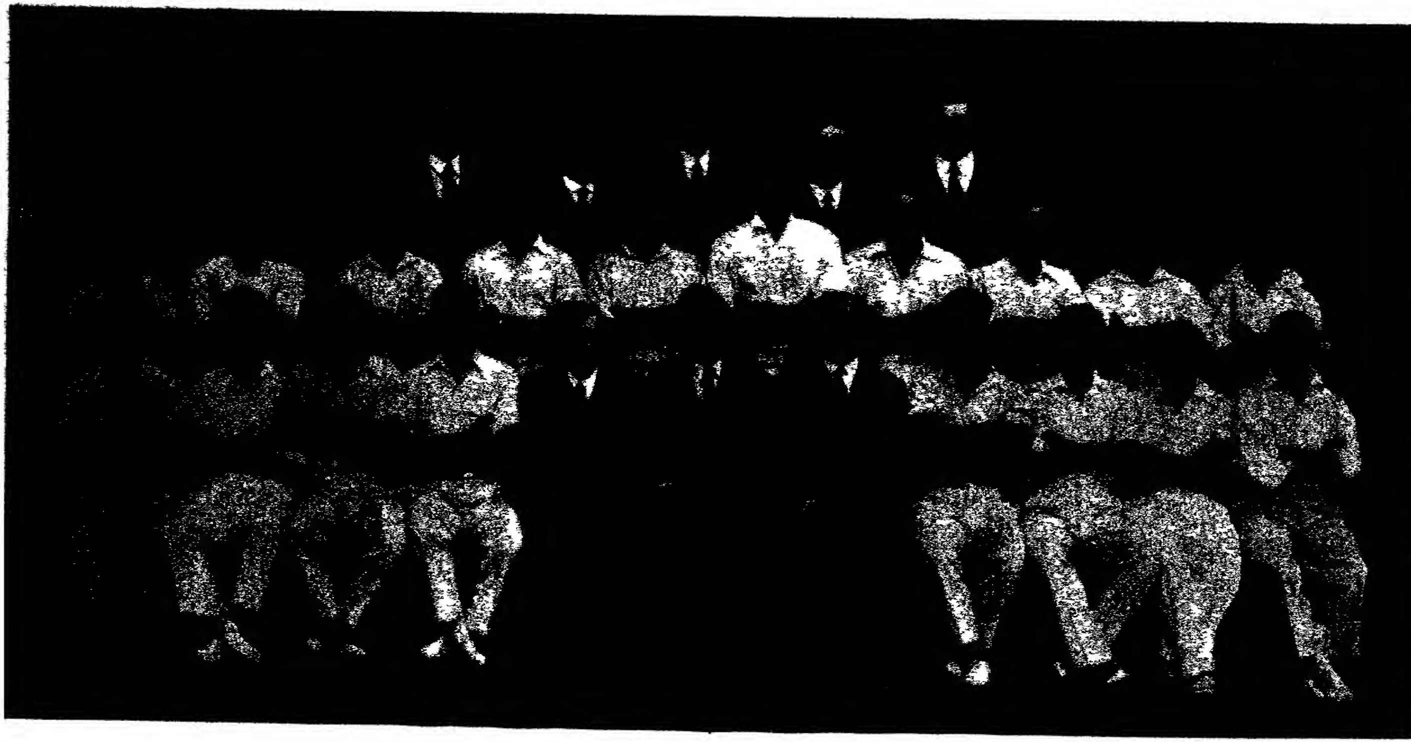


PLATE 169.—OFFICE BEARERS AND MEMBERS OF DEPARTMENT OF AGRICULTURE AND STOCK CRICKET TEAMS.

First Grade (Runners Up) and 3C Grade (Premiers), Q.C.A. (Warehouse Division), 1933 34.

Back Row.—E. Keefer, S. S. Hooper, R. Short, J. P. Orr, H. Barnes.

Second Row.—S. Davis, F. Burns, F. Bell, A. Kerr, H. S. Hunter, M. Muller, C. N. Morgan, W. E. Hamley, R. Pritchard, J. C. Maunder.

Front Row.—E. Taylor, C. Peel, C. J. McKeon, S. Pegg, E. Graham, (Under Secretary), Hon. F. W Bulcock, M.L.A. (Minister for Agriculture and Stock), R. Wilson (Assistant Under Secretary), R. Taylor, T. McKnight, W. Palmer, S. Burchill.

General Notes.

Staff Changes and Appointments.

Constable P. J. Purtill, of Yamba, has been appointed also an Inspector under the Slaughtering Act.

Mr. S. C. Knack, Broadmere, via Taroom, has been appointed an Honorary Inspector under and for the purposes of the Diseases in Stock Acts.

Mr. R. I. Robinson, care of Farleigh Mill, Farleigh, via Mackay, has been appointed millowners' representative on the Farleigh Local Sugar Cane Prices Board, in the place of Mr. T. G. Mulherin, who has resigned.

Mr. H. G. Mulherin, Cameron's Pocket, Calen, has been appointed to the position of canegrowers' representative on the Farleigh Local Sugar Cane Prices Board, which has been rendered vacant by the resignation of Mr. H. C. J. Hansen.

Mr. E. Richards, loader for the Committee of Direction of Fruit Marketing at Howard, has been appointed also an Honorary Inspector under the Diseases in Plants Acts.

Mr. A. Popham, Flinders lane, Townsville, has been appointed an honorary ranger under the Animals and Birds Acts.

Mr. E. H. H. George, Assistant Inspecting Check Chemist and Assistant Statistical Officer, Central Sugar Cane Prices Board, has been appointed Assistant Secretary to the Central Board.

The following Cane Testers have been appointed for the forthcoming sugar season:—P. H. Compton (Babinda Mill), Miss A. L. Levy (Bingera), T. D. Cullen (Cattle Creek), C. J. Boast (Fairymead), J. Macfie (Farleigh), T. Herbert (Gin Gin), T. Breen (Inkerman), Miss J. Orr (Invicta), L. G. F. Helbach (Isis), Miss J. O'Flynn (Kalamia), Miss D. Marles (Maryborough), Miss M. T. Smith (Millaquin), L. C. Home (Moreton), F. W. Trulson (Mossman), L. Chadwick (Mount Bauple), C. H. Jorgensen (Mourilyan), V. F. Worthington (Mulgrave), Miss I. Palmer (Pioneer), J. C. D. Casey (Plane Creek), W. J. Richardson (Pleystowe), Miss E. Christsen (Proserpine), T. P. Brown (Qunaba), J. Howard (Rocky Point), G. Tait (South Johnstone), Miss A. Walsh (Tully), R. D. Woolcock (Marian), H. T. Whitcher (North Eton), T. F. Corbett (Racecourse).

The following Assistant Cane Testers for the forthcoming sugar season have been appointed:—Miss M. A. Lyle (Babinda Mill), Mrs. M. Nally (Bingera), Miss E. Rowe (Farleigh), Miss D. Bowder (Inkerman), Miss A. Anderson (Invicta), Miss D. Aldridge (Isis), H. McAntee (Kalamia), Miss M. E. L. Wassell (Marian), D. Walton (Marian), Miss F. Foubister (Maryborough), Miss M. Thorburn (Millaquin), Miss N. Hooper (Moreton), Miss S. Wilkinson (Moreton), Miss M. Morris (Pioneer), St. C. G. Fanning (Plane Creek), Miss E. Crees (Plane Creek), Miss P. Southwick (Pleystowe), H. A. Larsen (Pleystowe), Miss T. Payne (Proserpine), Miss C. Humphreys (North Eton), C. H. Humphreys (Racecourse), Miss M. Orr (Racecourse), S. McRostie (South Johnstone), Miss A. Murray (Tully).

Mr. K. S. McIntosh (B.V.Sc. Sydney University), Lismore, has been appointed Government Veterinary Surgeon, Department of Agriculture and Stock. Mr. McIntosh will be attached to the Animal Health Station, Yeerongpilly.

Mr. A. A. Armitage and V. H. Stringer, of Bundaberg, have been appointed Honorary Rangers under the Animals and Birds Acts.

Messrs. W. L. Sanderson, J. Logan, and P. J. Brereton, members of the Eumundi Fruitgrowers' Association, Limited, have been appointed Honorary Inspectors under the Diseases in Plants Acts.

Mr. W. C. Burrowes, Clerk of Petty Sessions, Maryborough, has been appointed an Agent of the Central Sugar Cane Prices Board for the purpose of making inquiries in pursuance of the provisions of the Regulation of Sugar Cane Prices Acts regarding sales and leases of assigned lands in the Maryborough district.

Mr. C. G. Revitt, Dunk Island, has been appointed an Honorary Ranger under the Native Plants Protection Act.

New Boundaries of the Helidon and South Burnett Cleansing Areas.

An Order in Council has been issued under the Diseases in Stock Acts amending the existing boundaries of the Helidon and South Burnett cleansing areas. In the case of the South Burnett area, a portion of the Auburn-Chinchilla area has been included within its boundaries, together with a certain area of land lying between the two areas. The Helidon cleansing area will now include the Crow's Nest cleansing area.

Hail Insurance.

Regulations have been issued under the Primary Producers' Organisation and Marketing Acts adding to the Canary Seed Board Hail Insurance regulations which were issued in September, 1931. These empower the Canary Seed Board to establish a Hail insurance fund for the purpose of paying to canary seed growers compensation in respect of crop losses through hailstorm damage. The fund is created by a levy in the form of a pro rata premium charge against all growers calculated on the basis of the quantity of canary seed harvested and that on which hail compensation is payable each year, and is known as the Canary Seed Board Hail Insurance Compensation Fund. The levy is a charge against the grower, and may be a deduction from advances, but the sum chargeable in any one year shall not exceed 7½ per cent. of the total value of the canary seed insured during the same year.

All canary seed is automatically covered from the time it is fully out in ear until it is harvested, but such cover shall not extend beyond the 31st January in any year. Particulars in regard to claims for compensation and for the payment thereof are also contained in these regulations.

The regulations issued provide that crops shall not be entitled to compensation unless the same are totally destroyed, or if such crops are partially destroyed, unless they are actually harvested and the resultant grain is delivered to the Board. No crop shall be assessed in excess of 560 lb. of canary seed per acre. Further, no compensation shall be payable in respect of destruction of or damage to any crop, unless a return in the form provided has been lodged with the Board on or before the 30th September in each year. The return sets out the area planted, the area to be harvested, and other information. In any case where the Board is of opinion that good reason exists for the failure of any person to furnish a return, it will pay compensation under these regulations, notwithstanding such failure to furnish the return.

Plywood and Veneer Board.

Notice of intention to constitute a Plywood and Veneer Board was issued on the 22nd March last, and a petition invited on the question of the setting up or otherwise of such a Board, which was to be lodged by the 23rd April, 1934.

No petition was received, and Executive approval has been given to the issue of an Order in Council formally constituting a Plywood and Veneer Board for a term of one year as from the date of the Order. The Order provides for the declaration of all plywood and veneer produced in that portion of the State south of the twenty-third degree of south latitude to be commodities under the Primary Producers' Organisation and Marketing Acts, and for the constitution of a board in relation thereto. The board shall be a marketing board, consisting of ten elected representatives of the growers together with the Director of Marketing, or a deputy appointed by the Minister, and an officer of the Forestry Department. The members, except the Director of Marketing or his deputy, and the Forestry officer, shall be elected annually.

The commodities shall be vested in the Board as the owners thereof. The Board shall have authority to acquire and allocate raw material (including timber) required by producers, and shall receive and allocate to the producers, on a quota basis, as decided by the Board, all orders for the supply of plywood and veneer, and shall control the marketing thereof. The Board shall also control the appointment of agents in Queensland, the Commonwealth, and in other countries, and shall determine the remuneration of such agents.

The following have been appointed members of the Plywood and Veneer Board for the period from 3rd May, 1934, until 2nd May, 1935:—

Messrs. R. H. Bentley (Austral Plywood Pty., Ltd.), J. F. Brett (Brisbane Sawmills Pty., Ltd.), G. Brown (Brown and Broad Newstead Homes Ltd.), J. E. Christoe (Manumbar Timber Co. Pty. Ltd.), J. W. Jackson (Newmarket Plywood Co., Ltd.), W. L. Johnson (Newmarket Plywood Co., Ltd.), G. W. Nutting (Stanoply Timber Co. Pty., Ltd.), C. R. Paterson (Hancock and Gore, Ltd.), P. S. Reid (National Plywood Co. Pty., Ltd.), R. J. Donaldson (The Oxley Plywood Co. Pty., Ltd.), A. E. Gibson (Deputy for the Director of Marketing), and G. A. Duffy (Chairman, Timber Advisory Committee, Forestry Sub-Department).

Island Sanctuaries for Birds.

Holbourne Island, about 18 miles north of Cape Edgecombe, and Arkhurst, Langford, Black, and Bird Islands, situated about 30 miles north-easterly from Proserpine, have been declared sanctuaries under the Animals and Birds Acts.

Sugar-cane Assessment.

An Order in Council has been issued under the Regulation of Sugar Cane Prices Acts fixing the assessment on all sugar-cane received at mills on and after the date of this Order to be at the rate of 1¼d. per ton. This rate is similar to that of last year.

Butter Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts giving notice of intention to extend the operations of the Butter Board from 1st July, 1934, to the 7th February, 1935. A petition for a poll on the question of whether or not the Board should be extended for such term may be lodged by at least 10 per cent. of the growers on or before the 19th June.

Dairy Products Stabilisation Act.

Provision is made in the Dairy Products Stabilisation Act, which was passed last session, that where, after the passing of the Act, any circumstances arise whereby it shall appear to the Governor in Council (for the purpose of giving full effect to the objects and purposes of the Act, or for the proper stabilisation of dairy products) that any amendment of the Act shall be deemed desirable, such amendment may be made by Order in Council.

An Order in Council has been issued, amending, in certain particulars, the abovementioned Act. The amendments include the insertion in the Act of definitions for the words "process," "processing," and "cheese." A new definition of "dairy product" is inserted, and the definition of "quota" is amended.

Section 9 of the Act, which empowers the Dairy Products Stabilisation Board to promulgate a quota, which should be based on the quota determined by the Minister for Commerce, has been deleted, and a new section inserted in its place. This omits the reference to the necessity for basing the quota on that determined by the Minister for Commerce.

Minor amendments are made in section 10.

A new section (19A) provides that for the better enforcement of the Act, and in addition to any other provision in the Act in that behalf contained, the Supreme Court may, on the application of the Board, make any such order as it deems just and necessary in the nature of a mandamus or injunction to compel compliance with or restrain a breach or continuance of a breach of any of the provisions of the Act or Order in Council thereunder or of any lawful determination of the Board, and all necessary powers, authorities, and jurisdiction of the Supreme Court shall apply and extend herein and are vested in the Supreme Court accordingly.

Egg Board.

A regulation has been issued under the Primary Producers' Organisation and Marketing Acts, extending the Egg Board Levy Regulations for the period from 1st January, 1934, to 31st December, 1938. These regulations were issued in April, 1929, and extended until 31st December last, and empowered the Egg Board to make a levy at the rate of ½d. per dozen on all eggs delivered to the Board. The sums raised by the levy are used for administrative purposes of the Board.

Dairy Product Manufacturer Defined.

"The Dairy Products Stabilisation Act of 1933" provides that a "manufacturer" shall mean a person who manufactures in the State such weight of dairy products for sale as may from time to time be prescribed by Order in Council in any period prescribed by Order in Council. An Order in Council has been issued under the Dairy Products Stabilisation Act prescribing that the weight of dairy products aforesaid shall be ten pounds and that the period shall be one week. Accordingly, a manufacturer of dairy products shall manufacture within the State ten pounds of dairy products for sale in any one week.

Milk and Cream Testing Examination.

An examination of Certificates of Proficiency under "*The Dairy Produce Acts, 1920 to 1932*" in the subjects of milk and cream testing, milk grading, cream grading, butter making and cheese making, will be held on Saturday, 28th July, 1934, in centres that will, as far as possible be arranged to suit candidates, who should notify the undersigned not later than the 12th July. Entrance fee 5s. for each subject should accompany the application, with an additional 10s. 6d. if a special centre is desired. Candidates must not less less than eighteen years of age on the day of examination.

Rural Topics.

The Gestation Period of Brood Sows.

Data obtained locally and from various parts of the world prove the normal gestation period of the breeding sow—that is, the time that elapses between date of successful service and actual date of birth of the litter is 112 days, sometimes spoken of as three months, three weeks, and three days. It is frequently noticed that pigs that are carried over the normal gestation period have sharp black milk teeth when born, which they use, injuring the teats and udders of the sow, making her restless and inducing her to refuse to allow her young to suckle. It sometimes happens that the sow suffers such pain that she loses control of herself and will turn round suddenly and snap and bite the young pigs, sometimes breaking their ribs and limbs and causing much injury, which it is difficult to overcome. To prevent undue pain and distress to the sow and to protect the young pigs against themselves, these sharp black teeth should be cut off with a pair of tooth nippers when the pigs are a few days old. If they are left untouched it is possible that the sow may refuse to suckle her litter at all, and thus milk fever and inflammation of the teats and udders of the sow follows. Removal of the tusks of older pigs is also advised, though it is a much more difficult operation and can only successfully be carried out by an experienced hand.—E. J. SHELTON, H.D.A.

To Prevent Over-cropping in the Orchard.

Because of the light crop in many orchards this season, the trees will probably show an abundance of blossom buds in the coming spring, and if over-cropping is allowed to occur the fruit the next season will be small and of poor quality, whilst the reduced vitality of the trees will prevent a satisfactory crop the year following.

Whilst it may not be possible to prevent alternate cropping, it is possible, by means of pruning and judicious thinning of the spurs—supplemented by hand-thinning, if necessary—to prevent over-production of fruit, which not only reduces size and quality, but is one of the causes of alternate bearing of pome fruit.

The weakening effect of an abnormally heavy blossoming—even when no fruit set—was strikingly illustrated on several occasions recently with pear trees. Portions of the trees were heavily spur pruned, in some instances as much as 80 per cent. of the blossom buds being removed, and the limbs so treated not only carried a good crop of fruit but also made a fair amount of new wood growth, whilst unpruned portions of the trees, though a mass of bloom, failed to set any fruit or to make any wood growth.—A. and P. Notes, N.S.W. Department of Agriculture.

Fistulous Withers.

An article on fistulous withers in horses in the current issue of the New South Wales *Agricultural Gazette*, contains a point of very great interest to dairy farmers, namely, the relationship which exists between fistula of the withers of horses and contagious abortion of cattle.

In 1919 some German scientists reported that they had discovered a relationship between fistula of the withers in horses and contagious abortion in cattle. These workers discovered that the germs of contagious abortion of cattle were frequently present in the pus of horses affected with fistula. In 1928 this discovery was confirmed in France, and in 1930 similar confirmation came from America and Holland. In 1931 veterinarians in Western Australia reported the first association of these two diseases in that State, and in 1932 our own Veterinary Research Station at Glenfield obtained similar results. Similar reports have also come from England and from Sweden.

It is now accepted throughout the world that there is a definite relationship between contagious abortion in cattle and fistula of the withers of horses. This very interesting discovery is of extreme importance to horse owners and to dairy farmers for the reason that horses running on farms where contagious abortion is present would be liable to contract fistula of the withers. But more important still is the fact that a horse with a discharging fistula may spread millions of microbes of contagious abortion which are readily picked up by cattle to infect them with contagious abortion.

It is of some interest, too, that the large swellings (known as hygroma) which occasionally occur on a cow's knee very frequently contain precisely the same germ, and when these burst to discharge they serve an active means of spreading this all too prevalent germ.

Points in Lamb Marking.

The main consideration in lamb-marking, apart from the prevention of actual mortality, is the avoidance of any decided check in the growth of the lamb. Lambs should be marked as early as possible so long as they are healthy and active; if the operation is left too long there is more chance of a setback from loss of blood. The operation should be performed in the morning so that the lamb will have the bulk of the day in which to find its mother. If it is left until late in the day losses are likely to occur, especially if the night is cold.

The sheep should be mustered some time before the operations commence and the lambs allowed to settle down. There should be no rushing about, and dogs should be used as little as possible, as deaths from hemorrhage are very common when lambs are marked in an excited and overheated condition.

Cleanliness is vital in lamb-marking—heavy losses from various infections take place annually through sheepowners' failure to recognise this fact. The knife used for docking and tailing calls for special attention.

The most suitable type has the blade and handle all in one piece, but in any case it should be as plain and as sharp as possible, since germs may be harboured in' joints or corners and even in cracks in the blade or in slight irregularities in the cutting edge. Prior to the commencement of the operations the knife should be boiled, and it should be carried to the yards in the liquid in which it was boiled. Throughout the marking the knife should be dipped as frequently as possible in a carbolic solution or other disinfectant; and whenever it is out of the operator's hand it should be allowed to remain in the disinfectant.

Dirty yards are a breeding ground for various dangerous organisms, and the choice of the site for the operation is therefore important. It should be perfectly dry and well away from dust and dirt so as to minimise the risk of losses from lockjaw and blood-poisoning, and if the flock is not too large it is best to use temporary yards made of movable hurdles or wire-netting and stakes, in a fresh paddock each year. With large flocks this is perhaps impracticable, and the following treatment of the yards is recommended:—Remove the surface soil of the yards to a depth of about 6 in., and place it in a heap, where it should be thoroughly mixed with quicklime; then saturate the fresh surface exposed with a strong solution of non-poisonous sheep dip.

In addition to the above precautionary measure it is essential to adopt some means of preventing the germs of disease from gaining entrance into the flesh-cuts made in the scrotum and tail. As the yards, although the main, are not the only source of infection, it is recommended that wounds of the scrotum and tail be either smeared with tar or dressed with carbolised oil (1 part of carbolic acid to 12 parts of oil) before the lamb is released after the operation. This is most important.

Lambs dead of tetanus or other of the inoculable diseases commonly contracted during marketing, if not destroyed, form fresh centres of infection by absorption of the micro-organism by the earth. All carcasses should therefore be destroyed by burning.

When marking lambs in temporary yards or in a corner of a paddock, care must be taken that the ewes are not allowed to spread too far in the paddock before the lambs are released. Although it is inadvisable to keep the ewes and marked lambs in a yard for any length of time after marking, a little shepherding of the flock in the paddock will repay the owner by ensuring that the lamb obtains a drink of milk as soon as possible after the operation. Very often it is found that a number of lambs which are possibly more seriously affected by the operation will hang about the gates of the yard, and if the ewes are not kept handy for at least a little while these lambs will probably become isolated and lost.—A. and P. Notes, New South Wales, Department of Agriculture.

Care of the Separator.

The operation of the separator and the care devoted to its cleansing have a material effect on the quality of cream produced. On no account should the separator be left overnight without being dismantled, and all parts thoroughly cleansed and scalded. After separating, all utensils and separator parts with which milk has come in contact, including the vats, buckets, and strainer, should be washed with slightly warmed water and then submerged in boiling water and placed on racks to drain. The practice of wiping over the utensils with a cloth after scalding only serves to undo the work of sterilisation and to re-infect with bacterial organisms.

Milk should not be left lying about on the floor or under the separator block, and the surroundings should be kept sweet and clean, and the drains free to carry away the floor washings.

Deodorising of Cream—Farmers' Responsibility.

Considerable interest is being shown in the installation of deodorisers at some of the New South Wales butter factories, but the belief current in some places that these machines will relieve the dairy farmer of the necessity for care in the production of cream should be most strongly discountenanced, observes the "Agricultural Gazette" of New South Wales.

Unfortunately, much cream used in the production of choicest butter has been below choicest quality, and farmers have been paid highest butter prices for cream which, if used alone in the production of butter, would not have produced this quality. It has only been made possible to pay these prices for "border-line" cream by the fact that the percentage of good cream has been considerably greater than that of inferior cream. When these two qualities have been mixed together, or blended, and subsequently neutralised and pasteurised, a bare choicest grade butter have been produced.

The supplier of the lower grade cream may thank his careful neighbour and the pasteuriser for his good luck in obtaining the best price. It is certainly not playing the game for the careless supplier to impose on his more careful neighbour, for that is what it really amounts to. If his example should be followed generally, it would not be long before the point was reached—and there are evidences of it to-day in some places—that the quantity of good cream may be insufficient to permit of satisfactory blending of the different qualities. Under such conditions the general quality of the butter will undoubtedly suffer.

With the advent of the process of deodorising cream there is an impression in some quarters that the farmer will be relieved of the need of any care, and for the future he will be able to rely upon the deoderising machine to remove any and all faults, whether they be due to his neglect or to his bad management. The deodoriser is a valuable machine and was primarily developed for the elimination of vegetable chemical contaminations, which it does thoroughly, but it should not be regarded as a means by which to abstract the taints produced by the presence of objectionable microorganisms which have developed in the cream as the result of insanitary conditions or careless methods of production.

Care and scrupulous cleanliness, together with control of cream temperature, are just as necessary to-day on the part of the dairy farmer as they have always been. He must not expect mechanical appliances in the factory to remove faults which he himself can prevent by the exercise of common cleanliness and common sense. Given this attention the pasteuriser and deodoriser will remove any feed taints and so improve his cream that the production of choicest quality butter is reasonably assured.

Work in the Citrus Orchard.

The low returns received by citrus growers during the past two seasons has forced upon them a realisation of the fact that the utmost economy must be practised in production methods. There is at least one direction in which improved production can be achieved without increasing expenditure, and that is by producing fruit of a better commercial size (write officers of the Fruit Branch of the New South Wales Department of Agriculture in current notes). In coastal areas too great a proportion of citrus fruits is on the small size. Satisfactory size in fruit is mainly dependent on sufficient soil moisture and a thrifty tree condition.

Increasing the soil's capacity to retain moisture in established groves is possible only by increasing the organic content of the soil. In soil so improved the trees are enabled to send their roots down to a deeper feeding zone. In this connection the value of green manure crops should not be overlooked.

In green manuring trials carried out over several years and in many different types of soils purple vetch has proved a vern consistent and heavy producer. During wet seasons on the coast it is much more reliable than field peas. A sowing of from 10 to 20 lb. purple vetch seed per acre is economical, especially if drilled in with 1 cwt. of superphosphate. Under inland conditions the tick bean is the most satisfactory green crop. Many orchardists rely on weed growth for the supply of organic matter, but this is not sufficient, as is evidenced by the fact that many trees growing under such conditions are difficult to maintain in a thrifty state.

Another factor that assists in the satisfactory development of citrus fruits is the maintenance of the leaf-bearing area of the trees. In this relation timeliness of spraying may have a not unimportant influence. When spraying operations are delayed, heavier applications than would otherwise be necessary have to be used. Particularly is this the case where white wax scale has to be combated, where if control measures are so delayed that it becomes necessary to use larger amounts of soda or to have recourse to the use of certain spray oils, defoliation in some degree may result.

Plate 170.—Department of Agriculture and Stock Cricket Club.

Premiers 3C Grade, Q.C.A. (Warehouse Division), 1933-34.

Front Row.—R. Wilson (Assistant Under Secretary, Department of Agriculture), E. Taylor, R. Taylor (Captain), J. P. Orr (Chairman, Sports Club), F. Bell (Vice-Captain), L. Smith, H. Hunter (Chairman, Cricket Club).

Second Row.—W. E. Hamley (Hon. Secretary), A. C. Peel, R. Pritchard, D. S. Davis, T. McKnight, L. Burgess.

Feed Economy of Food Production.

One of our subscribers recently came to us with a question concerning the efficiency of farm animals in converting feed into human food.

Jordan has summarised the data bearing on this subject in his book, "The Feeding of Animals." After having studied the data available, and by using comparable methods of comparison, he presents the following data as indicating the relative efficiency of farm animals in converting a given amount of feed into human food:

PRODUCED BY 100 LB. OF DIGESTIBLE ORGANIC MATTER IN RATION.

Animal.	Marketable Product.	Edible Solids.
	Lb.	Lb.
Cow (milk)	139·0	18·0
Pig (dressed)	25·0	15·6
Cow (green cheese)	14·8	9·4
Calf (dressed)	36·5	8·1
Cow (butter)	6·4	5·4
Poultry (eggs)	19·6	5·1
Poultry (dressed)	15·6	4·2
Lamb (dressed)	9·6	3·2
Steer (dressed)	8·3	2·8
Sheep (dressed)	7·0	2·6

To dairy farmers the most noticeable fact brought out by this comparison is the position of the dairy cow in respect to feed economy of food production. Out of ten live stock food products the dairy cow with her milk, green cheese, dressed calf, and butter occupies the first, third, fourth, and fifth positions.

When it comes to producing edible solids in the form of meat, swine are far more efficient than other farm animals, being a close competitor even to the dairy cow if compared with milk. It is interesting to note that the growth of a pound of edible beef solids requires a feed expenditure of nearly seven times as great as is necessary for the elaboration of a pound of milk solids.

Thus it may be stated that the dairy cow is not only the most efficient producer of human food but also she produces the most nearly perfect food. These facts should be kept well in mind by dairy farmers.—"Hoard's Dairyman."

Points for the Sheep Man.

Whether he is producing fine, medium, or strong wool, it should be the aim of the breeder to see that it has pronounced quality for its type, points out an officer of the Sheep and Wool Branch of the New South Wales Department of Agriculture in the "Agricultural Gazette." In order to produce such wool, and a good type of flock sheep, it is essential that graziers give strict attention to details when breeding. The main requirements are summarised in the following advice:—

Do not be dictated to by fashion; breed the type of sheep that is suitable to your district.

Do not mate extremes.

Do not try to achieve in one year that which normally takes three or four years of careful selection and breeding.

Select good sires. Make certain that the sire is good on the points and underneath; too many rams are bred which are weak in these respects.

Remember that in the case of many small flocks one of the main faults is lack of density, indicated by spindly wool on shoulder and point. Therefore, good rams showing a fair amount of development are needed.

Cull fairly heavily in order to produce a wool displaying all-round quality.

Do not pamper your sheep and deceive yourself.

Do not judge a stud by its stud sheep, but rather by its flock sheep.

The Home and the Garden.

OUR BABIES.

(Issued by the Queensland Baby Clinics.)

Under this heading a series of short articles by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies, has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

OUR INVISIBLE ENEMIES.

OUR worst enemies are those we cannot see. Some we cannot see even with the microscope. Yet science has learnt much, and we are by no means defenceless. It is not many years since infectious diarrhœas were the principal cause of an enormous infant mortality. The ways in which these germs got into infants' food were discovered, and by simple precautions, of which natural feeding is the most important, the mortality from this cause has been reduced to a very low figure. More infants die now from bronchitis and pneumonia than from diarrhœa. Very little, almost nothing, is being done to prevent these deaths.

The Common Cold.

In children bronchitis and pneumonia nearly always follow some other infection, of which the most frequent is the "common cold." All three are caused by disease germs, but the germ of a "cold" is the pioneer that clears the road. Every winter this germ is specially active.

How It Spreads.

Some people are afraid of catching "colds" from exposure to the weather. They are deluded. "Colds" are rarely caught out of doors. We get them by sitting in closed rooms with other people who are carrying the germs in their air passages. Whenever they cough, a fine, invisible spray floats around them and we inhale it. The more people there are in the room the greater is the risk. 'Colds" may be spread among children by kissing and fondling, and by the child who puts his fingers in his mouth and smears them on his playfellow's face. It is easy to understand why "colds" are more frequent in winter.

How to Prevent Infection.

None of us can avoid these germs altogether, but we can avoid taking an overdose of them. The healthy body has powers of resistance, but only to a limited extent. A few germs are easily destroyed and may even increase our resistance, but a massive infection overcomes it.

Therefore, those who suffer from a "cold," if they cannot keep at home should keep their distance, and smother their coughs in their handkerchiefs. Babies and young children should be kept away from crowded rooms and halls. Children should be taught very early to keep their fingers out of their mouths. How little do we practise these simple precautions! We have known infants to be passed round large family gatherings like a church plate to collect not threepenny-bits but the pooled germs of the whole assembly!

How to Increase Resistance.

We must not only avoid massive infections, we must raise our children's resistance to the highest point. We must do this early, and not wait till they suffer from chronic catarrhs, diseased tonsils, and adenoids. Resistance is increased by healthy living—that is by plenty of fresh air and sunshine, open windows, sensible clothing (not over-clothing), and especially by good food. In particular give the child plenty of milk, a fair allowance of butter, green vegetables, some uncooked fruit, whole wheat or a daily spoonful of cooking bran (after two years of age). If he is not very strong give him cod liver oil or some substitute rich in vitamin.

Sweetmeats Lessen Resistance.

We all know how 'colds'' spread through the schools. A careful observer in Scotland noted that during the war, when sugar was severely rationed and sweetmeats were unobtainable, cases of catarrh of more than seven days' duration in a large boarding-school for girls were reduced by two-thirds. Since then he has made further observations and found that the occurrence of catarrhs was roughly proportionate to the sugar intake. Among schoolgirls who averaged about 1 lb. of sugar a week the catarrhal rate was 5·5 per cent. Among those who averaged about 2 lb. the rate was 24·6 per cent., more than four times as great. Whether their resistance was lowered by too much sugar, or by the sugar spoiling their appetites for vitamin-containing foods, is uncertain, but in either case sugar had done harm.

IN THE FARM KITCHEN.

CURRY AND RICE.

Materials—1 lb. bladebone steak or 1½ lb. neck chops; 1 onion; 1 apple; 1 tablespoonful dripping; 1 dessertspoonful flour; 1 tablespoonful sultanas; ½ lemon; 1 tablespoonful curry powder; 3 gills water; 1 dessertspoonful vinegar.

Utensils—Knife; board; saucepan; fork; wooden spoon; dish; basin.

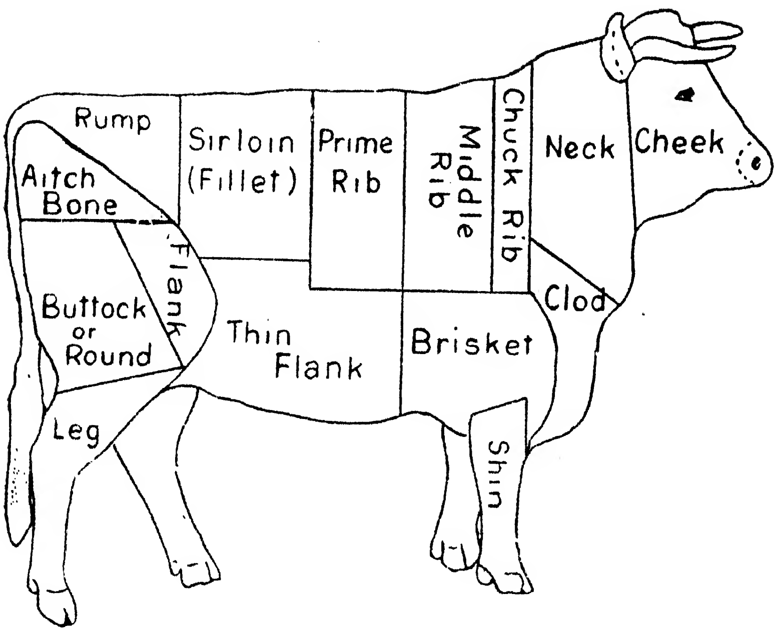
Method—

1. Cut up steak into strips or squares about ½ an inch thick; or trim chops, removing fat.
2. Peel and cut up the apple and onion; heat fat in a saucepan.
3. Add meat; fry it until both sides are brown; lift it out; put it on a plate.
4. Put into the hot fat the flour, apple, onion, sultanas, grated rind of lemon, and half the curry-powder.
5. Fry until all the ingredients are partly cooked; add water; bring to boiling point, stirring constantly.
6. Add meat; simmer for 1½ hours, taking care that the curry does not burn.
7. Add the remainder of the curry-powder, blended with vinegar; stir well; boil for 5 minutes.
8. Serve on a hot dish with a border of boiled rice round the curry.

Notes—

1. 1 tablespoonful of chutney may be used instead of the apple or sultanas.
2. Any kind of meat, poultry, or fish may be curried similarly; if cooked meat is used, a shorter time may be allowed for simmering.

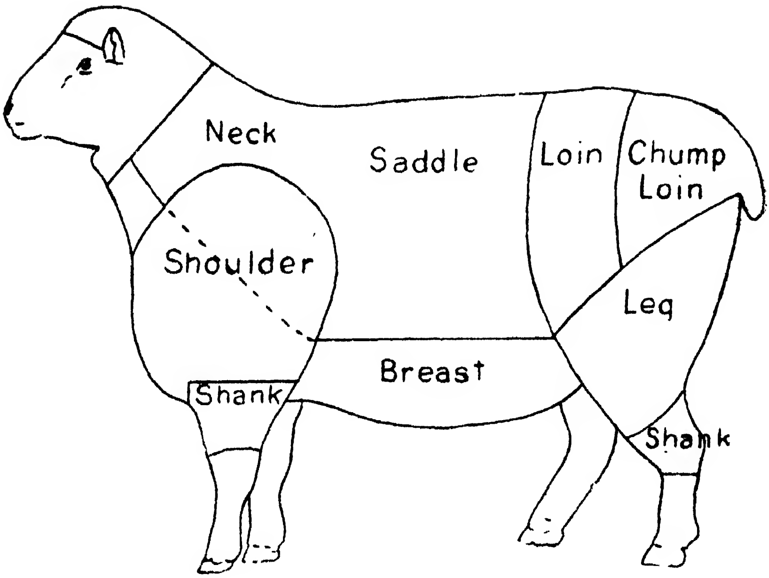
CUTS OF BEEF.



Methods of Cooking Beef.

Roasting or Baking.	Braising.	Boiling.	Stewing.	Frying or Broiling.	Salting or Spicing.	For Brawn.	For Soup.
Sirloin ..	Round ..	Flank	Clod ..	Rump	Chuck-rib	Leg ..	Round
Ribs ..	Aitchbone	Thin Flank	Flanks	Round	Round ..	Shin ..	Clod
Aitchbone	Flank ..	Brisket	..	Aitch-bone	Brisket	Cheek ..	Leg
Round ..	..	..	..	..	..	..	Bones
..	..	Round	Neck	Fillet..	Thin Flank	..	Flanks

CUTS OF MUTTON.



Methods of Cooking Mutton.

Roasting or Baking.	Braising.	Boiling.	Frying or Broiling.	Salting.	For Soup.
Leg ..	Neck ..	Leg ..	Leg chops ..	Leg ..	Bones
Shoulder	Chump loin	Neck ..	Loin chops ..	Breast ..	Shank
Loins ..	Shoulder ..	Breast ..	Neck chops ..		

Processes of Cooking and Preserving Meat.

Term.	Process.	Directions.
1. **Baking** or **Roasting**	1. Put dripping into baking dish; heat. 2. Roll meat in flour, pepper, and salt. 3. Place on trivet over hot dripping in baking dish. 4. Put into oven.	1. The oven must be very hot when the meat is put in. 2. After 10 minutes heat must be moderated. 3. Allow 15, 20, or 25 minutes for each lb. and 15, 20, or 25 minutes over. 4. Baste every half hour.
Braising ..	1. Place dripping and cut-up onions in saucepan. 2. Add meat rolled in flour, pepper, and salt. 3. Place over fire; brown slightly, pour off dripping; add water. 4. Cover saucepan and place on fire. 5. Add vegetables about ¾ hour before the meat is cooked; add salt to taste.	1. Only remove lid when necessary. 2. Take care that vegetables are not overcooked. 3. After 20 minutes heat must be moderated. 4. Allow 20 minutes for each lb. and 20 minutes over.
Broiling or **Grilling**	1. Trim meat or fish to the required thickness and shape. 2. Rub over the bars or wires of a gridiron with butter or dripping 3. Put meat on the gridiron. 4. Cook over a clear open fire, placing the meat as close to the fire as possible. 5. Sprinkle with salt and pepper and add small pieces of butter.	1. The fire must be hot and clear. 2. The meat must be turned often. 3. A double gridiron is best as juices escape if a fork is used to turn the meat. 4. Allow 5 to 10 minutes for cooking.
Boiling ..	1. Put fresh meat into boiling water. 2. Boil hard for 5 minutes. 3. Reduce heat of fire; add salt; remove scum; cover saucepan. 4. Simmer. N.B.—Put salt meat into cold water.	1. Water must be boiling. 2. Red meat must simmer 20 minutes for each lb. and 20 minutes over. 3. White meat and corned round must simmer 25 minutes for each lb. and 25 minutes over. 4. Corned brisket must simmer 30 minutes for each lb. and 30 minutes over.
Stewing ..	1. Fry cut up onions and vegetables in dripping in a saucepan; pour off dripping. 2. Remove fat from meat. 3. Cut meat into convenient pieces. 4. Put meat into saucepan with vegetables. 5. Add sufficient water to cover; simmer. 6. Before serving add pepper, salt, and blended flour.	1. The fire must be slow. 2. Stew must simmer for 2½ hours.

1. For baking beef and mutton allow 15 minutes for each lb. and 15 minutes over.
For baking veal and lamb allow 20 minutes for each lb. and 20 minutes over.
For baking pork allow 25 minutes for each lb. and 25 minutes over.

PROCESSES OF COOKING AND PRESERVING MEAT.—*continued.*

Term.	Process.	Directions.
Frying ..	1. Heat dripping to smoking point. 2. Roll meat in flour, pepper, and salt. 3. Put meat into smoking dripping over fire.	1. Dripping must be very hot and sufficient to cover meat. 2. Turn meat twice. 3. Allow 15 minutes for cooking.
Salting ..	1. Rub salt, brown sugar, and saltpetre into meat. 2. Place meat in a barrel or wooden tub. 3. Turn meat daily in its liquor.	1. One lb. salt to ½ lb. brown sugar and ½ oz. saltpetre. 2. Rubbing must be thorough. 3. A barrel or wooden tub is necessary.
Spicing ..	1. Rub into meat, salt, saltpetre, pepper, and pimento. 2. Place on large dish. 3. Rub and turn daily.	1. Half oz. saltpetre to 1 lb. salt. 2. Meat must be kept on a delf or enamel dish.
Brawn ..	1. Cut away meat from leg and shin. 2. Divide into convenient pieces. 3. Saw bones into small pieces. 4. Put meat and bones into a boiler. 5. Cover with cold water; boil; skim. 6. Add salt, pepper, and spices. 7. Turn out into large dish; remove bones; cut meat into small pieces. 8. Pour into dishes to set.	1. Cold water must be used. 2. Meat must simmer for 5 hours.
Soup ..	1. Break up bones and cut meat into small pieces. 2. Put into boiler; cover with cold water; add salt; allow to stand for 20 minutes. 3. Bring slowly to the boil; remove scum. 4. Add barley, rice, or macaroni and vegetables cut small. 5. Simmer for 3 hours; season with pepper and salt before serving.	1. Cold water must be used. 2. Bones must be broken up into small pieces. 3. Scum must be removed. 4. Soup must simmer for 3 hours. 5. Allow 2½ cups of water to 1 lb. of meat and bones.

BOILED RICE.

Materials—1 cup rice; 1 dessertspoonful salt; ½ teaspoonful lemon juice; 6 cups water.

Utensils—Saucepan; basin; strainer.

Method—

1. Put water on to boil in a large saucepan.
2. Wash rice in three waters; put it into the saucepan when the water is boiling.
3. Add salt and lemon juice; boil hard for 15 minutes.
4. Strain; return rice to saucepan to reheat and dry.

FLOWER GARDEN.

Winter work ought to be in an advanced state. The roses will not want looking after. They should already have been pruned, and now any shoots which have a tendency to grow in wrong directions should be rubbed off. Overhaul the ferneries, and top-dress with a mixture of sandy loam and leaf mould, staking up some plants and thinning out others. Treat all classes of plants in the same manner as the roses where undesirable shoots appear. All such work as trimming lawns, digging beds, pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, hollyhocks, verbenas, petunias, &c., which were lately sown. Sow zinnias, amaranthus, balsam, chrysanthemum tricolour, marigold, cosmos, cockscombs, phloxes, sweet peas, lupins, &c. Plant gladiolus, tuberoses, amaryllis, pancratium, ismene, crinums, belladonna lily, and other bulbs. Put away dahlia roots in some warm moist spot, where they will start gently and be ready for planting out in August and September.

No time is now to be lost, for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool, moist spring-time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses; and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lots, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground. Many of this class can, however, be successfully raised in the open if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *phlox Drummondi*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds. Mignonette is best sown where it is intended to remain. Dahlia roots may be taken up and placed in a shady situation out of doors; plant bulbs such as anemones, ranunculus, fresias, snowflakes, ixias, watsonias, iris, narcissus, daffodil, &c. The Queenland climate is not suitable for tulips.

To grow these plants successfully it is only necessary to thoroughly dig the ground over to a depth of not less than 12 inches, and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should be raked over smoothly so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave the plants (if in the border) at least 4 to 6 inches apart.

KITCHEN GARDEN.

Should showery weather be frequent during July, do not attempt to sow seeds on heavy land, as the latter will be liable to clog, and hence be injurious to the young plants as they come up. The soil should not be reworked until fine weather has lasted sufficiently long to make it friable. In fine weather get the ground ploughed or dug, and let it lie in the rough until required. If harrowed and pulverised before that time, the soil is deprived of the sweetening influences of the sun, rain, air, and frost. When the ground has been properly prepared, make full sowings of cabbage, carrot, broad beans, lettuce, parsnips, beans, radishes, leeks, spring onions, beetroot, eschalots, salsify, &c. As westerly winds may be expected, plenty of hoeing and watering will be required to ensure good crops. Pinch the tops of broad beans which are in flower and take up peas which require support. Plant out rhubarb, asparagus, and artichokes. In warm districts it will be quite safe to sow cucumbers, marrows, squashes, and melons during the last week of the month. In colder localities it is better to wait till the middle or end of August. Get the ground ready for sowing French beans and other spring crops.

The continued production of rhubarb may be greatly assisted by giving a heavy mulching of manure and hoeing it well into the soil. Keep the beds well watered, and give regularly a dressing of liquid manure, say, once a week.

It is not necessary to use forcing manures on the young stock, as plants are ruined if forced in the early stages of growth.

The rhubarb makes rapid growth during the autumn and spring, and when stalk cutting has been started liquid manuring and manuring may be given.

NOTES ON ROSE CULTURE.

The following notes on rose culture are taken from the Pacific Nurseries (Messrs. C. W. and A. C. Heers), Manly, Brisbane:—

Time for Planting.—From May until the end of September. For the coastal, excepting perhaps the Central and North, we specially recommend the later period, and, in support, advance the following reasons:—

Every horticulturist must admit that all roses, particularly in the coastal area of Queensland, invariably exhibit luxurious and succulent growth and wealth of bloom during the months of March, April, May, and early June. This being so, we contend that as the plants are full of flowing sap they are not in a fit condition for transplanting during that period. There are, however, odd seasons when plants ripen earlier. In such circumstances, we would not object to extra early planting, but consider May and June do not give the plants time to establish themselves sufficiently to withstand the approaching winter.

Roses planted during the earlier months readily respond to the warm periods which assuredly occur in the middle of our winter, only to be as surely struck by our colder and more frosty days during the latter part of the winter. This shock not only checks the growth, but actually kills the tender white jelly-like roots then in the forming. There can be only one result—a plant with stunted growth upon which the foundations of your future tree has to be built. Remember, if these plants are left undisturbed in the nursery they remain dormant.

On the other hand a thoroughly rested and ripened plant, transplanted during late July, August, or September, according to the trend of the season, is ready to break away into full and vigorous growth as the warmth of Spring appears, never to look back.

We readily admit that the rose, being a hardy plant, may even do well when planted early, but after much experience we prefer to pin our faith to late planting, in most parts of Queensland where our winter is so variable. Holding these views, we hope clients will follow our advice and plant late in the season, say, from the middle of July to the middle of September. However, from Rockhampton north, earlier planting may be preferable.

Roses planted during September and even October will do quite well; if planted this late they should, however, be provided with artificial shade and kept well watered until they are established.

It is gratifying to us to know that quite a number of clients, after acting upon our advice, write to say how pleased they are with their experience of late planting; so we reiterate—do not plant or prune roses too early in Queensland, especially along eastern slopes south of Bundaberg.

We must warn people that early planting is the cause of many failures, therefore, do not complain if you ignore our advice.

Selecting Varieties.—When making selections consult our brief descriptions and ascertain the variety's suitableness regarding its growth, style, colour, fragrance, and freedom of bloom. If you are not acquainted with the various varieties listed it will pay you to leave selection to us, mentioning any varieties you may already have. You will find a special list on the inside of the front cover, giving our choice in each colour.

Planting.—Roses should never be planted when the ground is sodden, as the soil glues together and excludes the air so necessary for the future welfare of the plant. Rather delay planting, and in the meantime bury the whole plant lengthwise, cover completely with soil and await more favourable conditions. It is surprising how long plants may be kept by this method.

Although roses do well under almost any condition, it will always repay you to trench and drain the ground. However, should the ground be flat and unsuitable for drainage, it is better to dig it a foot deep and raise the bed. Such beds require hardwood or concrete borders, otherwise the outside plants dry out too easily. Work in a liberal supply of well-rotted cow or stable manure. This work should be done at least four weeks prior to planting. Plant so that the union will be just under the surface of the ground. In the case of light sandy soil it is an advantage to have the union as much as 2 inches below the surface. Never, on any account, place fresh manure or any form of fertilizer near the roots at the time of planting.

The roots should be evenly spread and so arranged as to give them a downward tendency; cover with about 3 inches of fine soil and press down firmly; fill in and give a liberal supply of clean water. Keep the earth away from the graft until the plant strikes; in the meantime, mulch with straw in order to protect union and keep the soil from caking. Cover the outside edges of straw with soil to keep it in position.

The mulch also creates an ideal condition for further waterings. Should the weather continue dry, it will be necessary to water at intervals, according to the conditions. Do not use fresh manure or artificial fertiliser near the roots when planting. Should the sun's rays become hot after planting, it is advisable to provide the plant with artificial shade.

Suckers.—Always keep a sharp lookout for brier suckers, which may from time to time sprout from below the graft. These are readily detected by their foliage, and if not removed they will in time kill the rose tree. *However, on no account must any new rose growth from the base be interfered with.*

Manuring.—Roses should be heavily manured at least once a year, well-rotted animal manure being the best. It should be spread over the bed and lightly forked in. Bone dust and other suitable fertilizers are also beneficial. Established rose trees are greedy feeders, and periodical light dressings of fertilizer, applied during damp weather, will give good results. Heavy soil needs occasional dressings of lime, which, however, should not be used within a month or so of fertilizers.

Pruning.—There is no phase of rose culture more difficult to impart than that of pruning. After accepting the broad principles generally laid down, make a close study of the habits and peculiarities of the various types of roses. Apply commonsense methods and observe and profit by the results obtained. We are opposed to early pruning in this State for similar reasons to those advanced against early planting. However, varieties with H.P. strain may, if the canes are sufficiently ripened, be shortened during March or April to from 3 to 5 feet from the ground—the weaker the shorter. This will ensure a wealth of bloom in the late autumn. For the annual overhaul the end of July and August is the best time. Hard pruning, as practised in cold countries, must not be generally applied here. The reason is not far to seek, as the periods of inactivity are short and uncertain. Make the prevailing conditions your guide as to how and when to prune. Assist the pruning problem by observing the following golden rules during the entire season:—

(1) Cut away dead, spindle wood; (2) always cut blooms and stems that have bloomed well back to a strong eye; (3) never allow seed pods to form on the bush. By these means you will encourage correct growth and freedom of bloom. There are odd varieties which resent the knife, Penelope for instance.

It is most inportant that plants be kept free from scale and other diseases, otherwise valuable portions have to be prematurely removed to the detriment of the plant. Exhibitors should prune harder than those growing for general purposes. Tea roses require lighter treatment than H.T.'s and H.P.'s.

To prune, cut away all dead, diseased, and spindling wood; thin out anything that is liable to crowd; cut back shoots to a strong eye, pointing outward in the case of uprights and inward on those of spreading habits; preserve any new strong shoots coming from the base (often misnamed water shoots) that may serve to replace any worn-out stems that should be renewed every three years or so.

As soon as the new growth appears, carefully rub off any shoot that is likely to overcrowd or grow in a wrong direction.

Climbers should be allowed their fling during the time they are establishing themselves. Train the strongest canes horizontally, about 24 inches apart, shorten the ends, and cut away all other wood. Provide for the renewal of these trailers every few years.

Aphis.—Nicotine sprays, such as Black Leaf Forty, are most effective. They may be kept in check by applying the hose freely.

Scale.—Spray with either red oil, kerosene emulsion, or any lime-sulphur mixture. Many roses are lost annually through scale.

Grubs, &c.—For all leaf, plant, and flower eating insects, spray with arsenate of lead as directed.

Mildew.—This is a stubborn fungus disease that has for many years past baffled our scientists. The rose, like all other life, no doubt requires a properly balanced food, and as analyses show that our soils are often deficient in potash and lime, it is not altogether surprising to find that, where good dressings of wood ashes have been applied, appreciable improvement in reducing the mildew scourge is apparent. Experiments are being conducted all over the world in search for a cure for mildew, and reports to hand show that potash used in its various forms gives results which are at least reassuring. For our part we can say that we have found the use of wood ashes, also spent carbide, beneficial. If these are not available, try giving each established tree say 4 to 6 oz. of sulphate of potash, in addition to lime, and observe the result.

Regular sprayings with liver of sulphur (1 oz. to 2 gallons of water), or 1 oz. bicarbonate of soda to 1 gallon of water, or Bordeaux, will ward off attacks. Remedies: Flowers of sulphur, 9 parts; arsenate of lead, 1 part; well mixed; applied with a bellows when the dew is on the foliage. Sprays: Sulphuric acid, 1 part to 800 parts of rain water, 1 oz. bicarbonate of soda to 1 gallon of rain water is a helpful spray. A drastic remedy is 2 tablespoonfuls of lysol to 1 gallon of water. Spraying should be done before noon. Always treat the underneath as well as the top of the foliage.

Failures.—Failures are generally attributable to one or more of the following causes:—

Having used fresh manures or fertiliser at time of planting. Allowing roots to be exposed after unwrapping. Lack of drainage or planting in soggy ground through excessive wet weather. Planting too near the edge of raised beds, too near shrubs, trees, and/or hedges; also in shady positions. Allowing plants to dry out after westerlies. Giving too much water during first fourteen days in cold weather. Heavy frosts just after planting or even when the plant is established. Planting too deep, planting too shallow, or planting too loose. Acidity in damp or poorly prepared soils. Chemical reactions from fertilizers previously applied to the soil. Plants being knocked by children or the thoughtless gardener. Dogs and cats are often the cause of plants dying or being damaged. The use of strong soap suds, &c. Planting too early or too late. Planting in same spot where a rose has been growing unless soil has been replaced.

TOMATO SEED SELECTION.

In selecting tomatoes from which seed is to be saved, only that from the best yielding plants which conform strictly to the characteristics of the variety, both as regards type of vine and type of fruit, should be chosen. Several fruit should be cut open to be sure of the quality. A plant should be chosen that produces a large number of average size tomatoes rather than a plant with two or three large fruits and a number of small ones. Care should be taken to see that the plant is free from disease, as several tomato diseases are transmitted by the seeds.

The best method of separating tomato seed from the surrounding pulp is as follows:—Cut the fruit in halves and scoop the contents into a bucket, and when the latter is about half full, fill up with water. Stand the bucket aside and allow the contents to ferment, which will take from two to six days, according to the warmth of the weather. A froth forms on top of the water when fermentation is sufficiently advanced. Wash the contents of the bucket on a fine sieve or a layer of hessian and the pulp will come right away from the seed, which must be spread out in a thin layer to dry. Rapid drying is important to prevent moulding. When dry, rub the seed in the hands to separate the individual seeds. Seed harvested in this manner has averaged 94 per cent. germination.

As already indicated, selection from a plant which is free from disease is important, but as a further precaution the seeds should be dipped for ten minutes in a solution of mercuric chloride, 1 part in 1,000 parts of water, before planting. Proper precautions must be taken with mercuric chloride where there are children or animals, as it is highly poisonous if taken internally.

Orchard Notes for July.

THE COASTAL DISTRICTS.

THE marketing of citrus fruits will continue to occupy the attention of growers. The same care in the handling, grading, and packing of the fruit that has been so strongly insisted upon in these monthly notes must be continued if satisfactory returns are to be expected. Despite the advice that has been given over and over again, some growers still fail to grasp the importance of placing their fruit on the market in the best possible condition, and persist in marketing it ungraded; good, blemished, and inferior fruit being met with in the same case. This, to say the least, is very bad business, and as some growers will not take the necessary trouble to grade and pack properly, there is only one thing to do, and that is to insist on the observance of standards of quality and see that the fruit offered for sale complies with the standards prescribed, and that cases are marked accordingly.

Where the crop has been gathered, the trees may be given such winter pruning as may be necessary, such as the removal of broken or diseased limbs or branches, and the pruning of any superfluous wood from the centre of the tree. Where gumming of any kind is seen it should be at once attended to. If at the collar of the tree and attacking the main roots, the earth should be removed from around the trunk and main roots—all diseased wood, bark, and roots should be cut away, and the whole of the exposed parts painted with Bordeaux paste.

When treated, do not fill in the soil around the main roots, but allow them to be exposed to the air for some time, as this tends to check any further gumming. When the gum is on the trunk or main limbs of the tree cut away all diseased bark and wood till a healthy growth is met with, and cover the wounds with Bordeaux paste.

If the main limbs are infested with scale insects or attacked by any kind of moss, lichen, or fungus growth, they should be sprayed with lime sulphur.

Towards the end of the month all young trees should be carefully examined for the presence of elephant beetles, which, in addition to eating the leaves and young bark, lay their eggs in the fork of the tree. When the young hatch out they eat their way through to the wood and then work between the wood and the bark, eventually ringbarking one or more of the main limbs, or even the trunk. A dressing of strong lime sulphur to the trunk and fork of the tree, if applied before the bettles lay their eggs, will act as a preventive. In the warmer localities a careful watch should also be kept for the first appearance of any sucking bugs, and to destroy any that may be found. If this is done systematically by all growers the damage done by this pest will be very much reduced.

Citrus trees may be planted throughout the month. Take care to see that the work is done in accordance with the instructions given in the June notes. All worn-out trees should be taken out, provided the root system is too far gone to be renovated; but when the root system is still good the top of the tree should be removed till sound, healthy wood is met with, and the portion left should be painted with a strong solution of lime sulphur. If this is done the tree will make a clean, healthy growth in spring.

The inclusion of a wide range of varieties in citrus orchards—and which has been the general practice—is to be deprecated. Even in new plantations there is a tendency to follow the same unprofitable lines. Far too much consideration is given to the vendor's description for the purchaser's appreciation of a particular variety or varieties. Individual tastes must be subordinated to market requirements, and the selection of varieties to the best available kind of early, medium, and late fruits. Amongst oranges Joppa should be placed first, Sabina for early fruit, and Valencia or Loon Giru Gong for late markets.

In mandarins local conditions influence several varieties, and since the introduction of the fungus known as "scab" the inclusion, particularly on volcanic soil, of the Glen Retreat and Emperor types is risky. In alluvial lands, Emperor and Sovereign (an improved Glen Retreat) are the most profitable, though Scarlet in many places is worth including, with King of Siam as a late fruit.

Land intended for bananas and pineapples may be got ready, and existing plantations should be kept in a well-cultivated condition so as to retain moisture in the soil.

Bananas intended for Southern markets may be allowed to become fully developed, but not coloured, as they carry well during the colder months of the year, unless they meet with a very cold spell when passing through the New England district of New South Wales.

The winter crop of smoothleaf pines will commence to ripen towards the end of the month, and when free from blackheart (the result of a cold winter) or from fruitlet core rot, they are good for canning, as they are of firm texture and stand handling. Where there is any danger of frost or even of cold winds, it pays to cover pines and also the bunches of bananas. Bush hay is used for the former and sacking for the latter.

Strawberries should be plentiful during the month, provided the weather is suitable to their development, but if there is an insufficient rainfall, then irrigation is required to produce a crop. Strawberries, like all other fruits, pay well for careful handling, grading, and packing; well-packed boxes always realising a much higher price than indifferently packed ones on the local market. Where strawberries show signs of leaf blight or mildew, spray with Bordeaux mixture for the former and with sulphide of soda for the latter.

When custard apples fail to ripen when gathered, try the effect of placing them in the banana-ripening rooms, and they will soon soften instead of turning black.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

JULY is a busy month for the growers of deciduous fruits, as the important work of winter pruning should, if possible, be completed before the end of the month, so as to give plenty of time for spraying and getting the orchard into proper trim before the spring growth starts.

In pruning, follow the advice given in the May number; and if you are not thoroughly conversant with the work, get the advice of one of the Departmental officers stationed in the district.

Pruning is one of the most important orchard operations, as the following and succeeding seasons' crops depend very largely on the manner in which it is carried out. It regulates the growth as well as the number and size of the fruit, as if too much bearing wood is left there is a chance of the tree setting many more fruits than it can properly mature, with a result that unless it is rigorously thinned out it is under-sized and unsaleable. On the other hand, it is not advisable to unduly reduce the quantity of bearing wood, or a small crop of overgrown fruit may be the result.

Apples, pears, and European varieties of plums produce their fruits on spurs that are formed on wood of two years' growth or more; apricots and Japanese plums on new growth and on spurs; but peaches and nectarines always on wood of the previous season's growth. Once peachwood has fruited it will not produce any more from the same season's wood, though it may develop spurs having a new growth or new laterals which will produce fruit.

The pruning of the peaches and nectarines, therefore, necessitates the leaving of sufficient new wood on the tree each season to carry a full crop, as well as the leaving of buds from which to grow new wood for the succeeding year's crop. In other words, one not only prunes for the immediately succeeding crop, but also for that of the following season.

All prunings should be gathered and burnt, as any disease that may be on the wood is thoroughly destroyed. When pruned, the trees are ready for their winter spraying with lime sulphur.

All kinds of deciduous trees may be planted during the month provided the ground is in a proper state to plant them. If not, it is better to delay planting until August, and carry out the necessary work in the interval. The preparation of new land for planting may be continued, although it is somewhat late in the season, as new land is always the better for being given a chance to mellow and sweeten before being planted. Do not prune vines yet on the Granite Belt; they can, however, be pruned on the Downs and in the western districts.

Trees of all kinds, including citrus, can also be planted in suitable situations on the Downs and western districts, and the pruning of deciduous trees should be concluded there. If the winter has been very dry, and the soil is badly in need of moisture, all orchards in the western districts, after being pruned and ploughed, should receive a thorough irrigation (where water is available) about the end of the month, so as to provide moisture for the use of the trees when they start growth. Irrigation should be followed by a thorough cultivation of the land to conserve the water so applied. As frequently mentioned in these notes, irrigation and cultivation must go hand in hand if the best results are to be obtained, especially in our hot and dry districts.

Farm Notes for July.

FIELD.—Practically the whole of the work on the land for this month will be confined to the cultivation of winter crops, which should be now making good growth, and to the preparation of land for the large variety of crops which can be sown next month. Early-maturing varieties of wheat may be sown this month. The harvesting of late-sown maize will be nearing completion, and all old stalks should be ploughed in and allowed to rot. Clean up all headlands of weeds and rubbish, and for this purpose nothing equals a good fire. Mangels, swedes, and other root crops should be now well away, and should be ready for thinning out. Frosts, which can be expected almost for a certainty this month, will do much towards ridding the land of insect pests and checking weed growth. Cotton-picking should be now practically finished and the land under preparation for the next crop. The young lucerne should be becoming well established; the first cutting should be made before the plants flower—in fact, as soon as they are strong enough to stand the mowing machine—and the cutting of subsequent crops should be as frequent as the growth and development of the lucerne plants permit. Ordinarily cutting should be regulated to fit in with the early-flowering period—i.e., when about one-third of the plants in the crop are in flower.

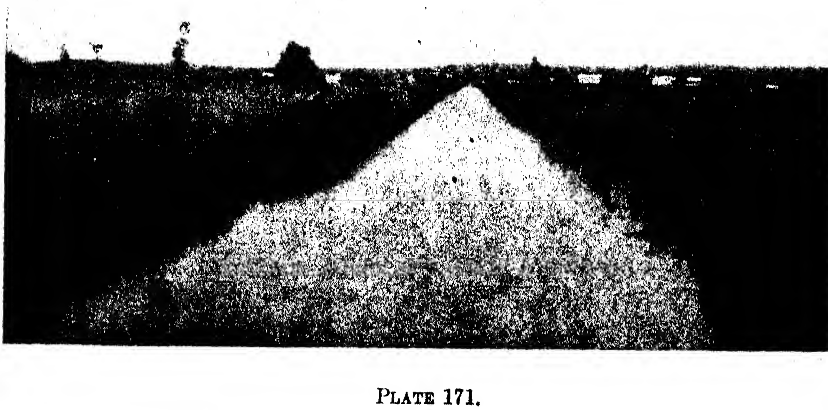


PLATE 171.
A main channel, Theodore Irrigation Settlement, Queensland.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF APRIL, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING APRIL, 1934, AND 1933, FOR COMPARISON.

Divisions and Stations.	Average Rainfall. Apr.	Average Rainfall. No. of Years' Records.	Total Rainfall. Apr., 1934.	Total Rainfall. Apr., 1933.
North Coast.	In.		In.	In.
Atherton	4·29	33	6·05	11·35
Cairns	11·52	52	13·38	18·63
Cardwell	8·87	62	11·16	9·09
Cooktown	8·75	58	12·86	16·86
Herberton	3·80	48	4·39	6·98
Ingham	7·82	42	4·19	3·01
Innisfail	19·94	53	39·35	24·19
Mossman Mill ..	8·77	21	4·42	22·19
Townsville	3·47	63	1·69	5·61
Central Coast.				
Ayr	2·56	47	1·03	2·76
Bowen	2·78	63	0·81	2·74
Charters Towers ..	1·54	52	1·09	0·55
Mackay	6·37	63	3·02	4·61
Proserpine	5·90	31	4·39	5·95
St. Lawrence ..	2·85	63	2·05	1·97
South Coast.				
Biggenden	2·19	35	4·55	3·69
Bundaberg	3·12	51	11·91	5·83
Brisbane	3·86	83	6·33	8·95
Caboolture	4·41	47	16·19	8·85
Childers	2·85	39	6·13	3·50
Crohamhurst.. ..	6·74	41	15·90	12·61
Esk	3·10	47	3·91	4·98
Gayndah	1·48	63	2·05	2·92
Gympie	3·43	64	9·07	3·47
Kilkivan	2·28	55	4·94	2·42
Maryborough ..	3·78	63	10·12	3·65
Nambour	6·30	38	10·62	11·98
Nanango	1·98	52	3·67	2·24
Rockhampton ..	2·61	63	3·00	1·57
Woodford	4·71	47	9·32	14·32

Divisions and Stations.	Average Rainfall. Apr.	Average Rainfall. No. of Years' Records.	Total Rainfall. Apr., 1934.	Total Rainfall. Apr., 1933.
Central Highlands.	In.		In.	In.
Clermont	1·65	63	0·68	1·88
Gindie	1·25	35	0·14	2·90
Springsure	1·59	65	1·75	0·78
Darling Downs.				
Dalby	1·40	64	3·33	1·24
Emu Vale	1·39	38	3·90	2·00
Hermitage	1·46	28	2·72	1·82
Jimbour	1·38	46	3·58	1·07
Miles	1·49	49	2·42	1·87
Stanthorpe	1·76	61	4·69	1·57
Toowoomba ..	2·60	62	6·28	3·68
Warwick	1·67	69	2·36	1·81
Maranoa.				
Roma	1·35	60	0·78	0·89
State Farms, &c.				
Bungeworgorai ..	1·28	20	0·72	1·15
Gatton College ..	1·89	35	..	1·91
Kairi	4·11	20	..	10·74
Mackay Sugar Experiment Station	4·95	37	2·57	4·40

GEORGE G. BOND, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—APRIL, 1934.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.		Deg.		Deg.		Points.	
Cooktown	29·82	85	73	89	9	69	5	1,286	14
Herberton	..	76	61	84	6	53	16	439	15
Rockhampton	29·97	83	66	90	16	55	24	300	11
Brisbane	30·05	78	62	86	19	50	24	633	16
Darling Downs.									
Dalby	30·03	79	54	89	18	36	24	333	8
Stanthorpe	..	70	49	81	8	21	24	469	11
Toowoomba	..	72	53	82	19	33	24	628	14
Mid-interior.									
Georgetown	29·85	90	66	97	2	56	15, 16	90	6
Longreach	29·96	89	62	97	6,7,8	50	23, 25	115	2
Mitchell	30·03	81	52	91	18	33	24, 25	36	3
Western.									
Burketown	29·86	93	72	102	8	64	27	53	2
Boulia	29·96	88	63	100	6, 7	47	25	15	1
Thargomindah	30·03	80	59	93	5	42	29	86	2

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY D. EGLINTON, F.R.A.S., AND A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	June, 1934.		July, 1934.		MOONRISE. June, 1934.	MOONRISE. July, 1934.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					p.m.	p.m.
1	6·37	5·2	6·45	5·7	8·33	9·38
2	6·37	5·2	6·45	5·7	9·42	10·40
3	6·38	5·2	6·45	5·7	10·47	11·41
4	6·38	5·2	6·45	5·8	11·49	a.m.
5	6·39	5·2	6·45	5·8	a.m.	12·40
6	6·39	5·2	6·45	5·8	12·51	1·40
7	6·39	5·2	6·45	5·9	1·49	2·39
8	6·40	5·2	6·45	5·9	2·47	3·36
9	6·40	5·3	6·44	5·9	3·48	4·31
10	6·40	5·3	6·44	5·10	4·47	5·24
11	6·40	5·3	6·44	5·10	5·43	6·12
12	6·40	5·3	6·44	5·10	6·38	6·57
13	6·41	5·3	6·44	5·11	7·30	7 35
14	6·41	5·3	6·44	5·11	8·18	8·9
15	6·41	5·3	6·44	5·12	9·1	8·39
16	6·41	5·3	6·43	5·12	9·37	9·10
17	6·42	5·4	6·43	5·13	10·10	9·35
18	6·42	5·4	6·43	5·13	10 39	10·5
19	6·42	5·4	6·42	5·14	11·8	10·36
20	6·42	5·4	6·42	5·14	11·37	11·8
					p.m.	
21	6·43	5·4	6·41	5·15	12·8	11·47
						p.m.
22	6·43	5·4	6·41	5·15	12·40	12·34
23	6·43	5·4	6·40	5·16	1·16	1·30
24	6·44	5·4	6·40	5·16	1·58	2·35
25	6·44	5·5	6·39	5·17	2·51	3·44
26	6·44	5·5	6·39	5·17	3·54	4·55
27	6·44	5·5	6·38	5·18	5·2	6·9
28	6·44	5·5	6·38	5·18	6·12	7·18
29	6.44	5.6	6·37	5·19	7·24	8·24
30	6·44	5·6	6·37	5·19	8·31	9·27
31	..	..	6·36	5·20	..	10·29

Phases of the Moon, Occultations, &c.

4 June	☽	Last Quarter	10 53 p.m.
12 „	●	New Moon	12 11 p.m.
20 „	☾	First Quarter	4 37 p.m.
27 „	○	Full Moon	3 8 p.m.

Apogee, 15th June, at 8.18 p.m.
Perigee, 28th June, at 10.54 a.m.

Venus, not nearly so brilliant as in January, will be conspicuous near the border of Pisces and Aries.

In the early mornings of the first three or four days of June the apparent nearness of Venus and Uranus, separated by little more than three diameters of the Moon on the 2nd, will form an interesting object for observers with telescopes.

Saturn, near the border of Capricornus and Aquarius, will be only 3 degrees south of the Moon when it rises at 10.47 p.m. on the 3rd.

Always an interesting object in a telescope, it will be coming into view late at night, rising at 10.49 p.m. on the 1st and at 9.54 p.m. on the 15th. Its unique ring-system has been closing in for the last six years, so that it will be far from at its best; but about one-third of its northern side may still be seen.

The Moon will be passing from west to east of Mars at 9 p.m. on the 11th, but the Sun, being only 14 degrees further east, and there being an interval of only 27 hours till new Moon, no observations will be generally practicable.

Jupiter, in Virgo, which had seemed to be moving westward since 20th February, will become stationary on 11th June, and afterwards continue its normal eastward direction till the end of the year. It will be the principal evening star during the month, remaining almost in the same spot in Virgo.

Mercury will reach its greatest elongation, 24 degrees east of the Sun on the 14th, and remain above the horizon for about one hour and three-quarters after sunset, being then very near the place in Gemini where Pluto was discovered four and a-half years ago, in the neighbourhood of Delta Geminorum, a star of magnitude 3½. Observers will find this an easy and interesting object. At 5 o'clock in the afternoon of the 14th the crescent-shaped Moon will be only one degree north of Mercury.

On the 22nd Jupiter will be passed by the Moon at 2 a.m.; the planet then being 7 degrees (one degree more than the length of the Cross) north of it.

An interesting occultation of Antares, the principal star of Scorpio, should be looked for about 9 p.m. on the 25th, when the Moon and the star will be very nearly overhead at Brisbane, Toowoomba, and Warwick.

4 July.	☽	Last Quarter	6 28 a.m.
12 „	●	New Moon	3 6 a.m.
20 „	☾	First Quarter	4 53 a.m.
26 „	○	Full Moon	10 9 p.m.

Apogee, 13th July at 4.12 a.m.
Perigee, 26th July at 8.18 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.